CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY

(THREE YEARS PROGRAMMEME)

2024

SYLLABUS

B.Sc. in Medical Laboratory Technology

Preface: Preface: Medical Laboratory Technology plays a vital role in diagnosing and preventing diseases through clinical laboratory tests, serving as a complementary field to medical science. This discipline involves the analysis of body matter such as fluids, tissues, and blood, along with screening for microorganisms, conducting chemical analyses, and performing cell counts. Medical Technologists are indispensable to the medical profession, contributing to accurate diagnoses and ensuring the efficient operation of Biochemical Laboratories through their technical and practical expertise.

Professionals with a B.Sc. in Medical Laboratory Technology (MLT) can advance to supervisory or managerial roles in laboratories and hospitals. Career paths include positions such as Laboratory Manager, Consultant, Supervisor, Healthcare Administrator, Hospital Outreach Coordinator, or Laboratory Information System Analyst/Consultant. Additionally, they can excel as Educational Consultants or Coordinators. Emerging opportunities exist in specialized fields like molecular diagnostics, molecular biotechnology companies, in vitro fertilization (IVF) labs, and research laboratories.

Programmeme: B. Sc. in Medical Laboratory Technology

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: Pass in +2 Science from a recognized board of the country, with individually pass in the subjects of Physics, Chemistry, Biology and/or Mathematics and have secured minimum of 50% marks in Physics, Chemistry Biology or Mathematics taken together (40% for SC/ST and 45% for Physically Challenged candidates)

Examination: Examination rules will be as per guideline of CUTM Examination handbook.

Mini Project: As part of the course requirements, candidates are expected to undertake a mini project, as outlined in the course structure. Upon completion of the mini project, students must submit a dissertation detailing their work. The internal evaluation will include a presentation and viva-voce, which will be conducted by the respective School.

Internship: Candidates are required to complete a six-month internship at a hospital, diagnostic center, or government or private organization that is equipped with modern microbiology laboratory facilities, or at a fully equipped pathology laboratory that meets the University's established guidelines.

The dissertation is mandatory for all students. Students will conduct their dissertation work either individually or in groups of up to three. The dissertation/ internship report should follow a research thesis format, including chapters such as: Introduction, Materials and Methods, Results and Discussion, and References/Bibliography. The final dissertation must be submitted in a typewritten and bound format.

Degree: The Bachelor of Science in Medical Laboratory Technology (B.Sc. MLT) degree from Centurion University is awarded to candidates who complete the prescribed three-year academic programme, successfully pass all examinations as outlined in the curriculum, and fulfill a mandatory six-month internship during the final semester.

Upon completing the programme with a minimum of **140 course credits**, students will receive the **B.Sc. in Medical Laboratory Technology** degree, signifying their readiness to contribute to the field of clinical laboratory science.

PROGRAMME OUTCOMES (POs)

PO	Outcomes
PO1	Possess a strong foundation of knowledge in the core concepts, theories, and principles of allied health.
PO2	Demonstrate competence in performing a range of clinical procedures and techniques.
PO3	Collaborate with professionals from different healthcare disciplines, demonstrating teamwork.
PO4	Exhibit professionalism, integrity, and ethical conduct in their interactions with patients, colleagues.
PO5	Apply critical thinking skills to analyze complex healthcare scenarios and solve problems.
PO6	Demonstrate leadership qualities and possess basic knowledge of healthcare management principles.
PO7	Provide compassionate and comprehensive patient care.
PO8	Embrace a commitment to lifelong learning and professional development.

PO9	Demonstrate effective verbal and written communication skills.
PO10	Promote health and wellness by educating individuals and communities about healthy lifestyles, disease prevention strategies, and the importance of early intervention.
PO11	Respect and appreciate the cultural diversity of patients and communities.
PO12	Understand the importance of research in advancing allied health practice.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1	To provide quality, accurate and timely laboratory results in a cost-effective manner
PSO2	To improve the skills that reflect current standards in healthcare
PSO	To validate laboratory results with accuracy and precision

PROGRAMME STRUCTURE

B.Sc. in Medical Laboratory Technology

CHOICE BASED CREDIT SYSTEM (CBCS) STRUCTURE

Category	Minimum Credits to be completed	Minimum Credits to be completed
School (Core)	**16**	**140**
Discipline (Core)	**76**	
Skill Basket#	**12**	
Value Added**	**6**	
AECC	**6**	
Summer Internship##	**4**	
Project	**10**	
Internship	**10**	

#Skill course is to be registered by the student during 1st, 2nd and 3rd semester

**Value added course to be registered by the student one time in each year

##Summer Internship during summer vacation post 2nd semester and 4th semester

BASKET -I

School Core Courses

Sl. no.	CODE	SUBJECT	SUBJECT TYPE (T + P + Pj)	CREDITS
1	CUTM4284	Human Anatomy and Physiology	3+1+0	4
2	CUTM4285	Cell Biology	2+0+1	3
3	CUTM4286	Biochemistry	2+1+0	3
4	CUTM1721	Research Methodology	2+0+1	3
5	CUTM4327	Clinical Pathology	2+1+0	3
			Total Credit	**16**

BASKET-II

Discipline Core Courses

Sl. no.	CODE	SUBJECT	SUBJECT TYPE (T + P + Pj)	CREDITS
1	CUTM4287	Hematology	3+1+0	4
2	CUTM4288	Analytical Biochemistry	3+1+0	4
3	CUTM1737	Molecular Biology	3+0+1	4
4	CUTM4289	Cytological Techniques	2+1+0	3
5	CUTM1742	Basic Computer and Information Science	0+2+0	2
6	CUTM1734	Medical Law and Ethics	2+0+1	3
7	CUTM4290	Microbiology	2+1+0	3
8	CUTM4293	Systematic Virology and Mycology	3+1+0	4
9	CUTM1746	Epidemiology	2+0+1	3
10	CUTM4295	Immunology	3+1+0	4
11	CUTM1730	Medical Instrumentation And Technique	2+2+0	4
12	CUTM4292	Vitamins and Hormones	2+2+0	4
13	CUTM4323	Histopathology and Cytology	2+1+0	3
14	CUTM4330	Advanced Hematology	2+1+0	3
15	CUTM4313	Applied Hematology	2+2+0	4
16	CUTM4317	Medical Laboratory Management	3+0+1	4
17	CUTM4314	Immunopathology	2+1+0	3
18	CUTM4329	Blood Banking	2+1+0	3
19	CUTM4318	Health Programmeme in India	3+0+1	4
20	CUTM4320	Introduction to Quality and Patient Safety.	3+0+1	4
21	CUTM4315	Paracytology	3+1+0	4

22	CUTM1754	Mini Project	0+0+2	2
Total				76

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

HUMAN ANATOMY AND PHYSIOLOGY

Subject Name	Code	Type of course	T-P-Pj	Credit
Human Anatomy and Physiology	CUTM4284	Theory+ Practice	3-1-0	**4**

Course Objective:

- To gain comprehensive knowledge of the basic structure of the human body, including cells, tissues, organs, and systems.
- To understand how various systems of the body function and interact to maintain homeostasis and support life.
- To acquire detailed knowledge of specific systems such as the musculoskeletal, nervous, cardiovascular, respiratory, digestive, endocrine, urinary, and reproductive systems.
- To develop skills in identifying anatomical structures and understanding physiological processes through laboratory exercises, dissections, and clinical correlations.

Course Outcome:

After completion of the course, the students will be able to,

Cos	Statements	COs With POs and PSOs Mapping
CO1	Understand the major anatomical terminologies.	PO1, PO7, PO12

CO2	Know the basic concept of human anatomy and physiology.	PO1, PO3, PSO1
CO3	Identify locations of major organs of each system.	PO1, PO10, PO11
CO4	Analyse interrelationships at molecular, cellular and tissue level.	PO2, PO5, PO13, PSO2
CO5	Apply the knowledge for understanding the functions of different organs in human body.	PO1, PO4, PO8, PSO3

Course Outline:

Module-I

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.

Practice: Identification of different organs and systems from charts.

Module-II

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.

Module-III

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 of the morphology of different blood cells. Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Module-IV

Urinary System: Various parts of the urinary system and their functions, structure and functions of the 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.

Practice: Demonstration of various parts of the urinary system and digestive system.

Module-V

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

Practice: Demonstration of various parts of the endocrine and reproductive systems.

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.

CELL BIOLOGY

Subject Name	Code	Type of course	T-P-Pj	Credit
Cell Biology	CUTM4285	Theory+ Project	2-0-1	**3**

Course Objective:

- To determine the parts of the cell membrane and the cell wall.
- To distinguish the types and mechanisms of mutation.
- To compare and contrast the events of the cell cycle and its regulation.
- To understand the dynamic character of cellular organelles.

Course Outcome:

After completion of the course the students will be able to

COs	Statements	COs with POs and PSOs

		Mapping
CO1	Describe the fundamental principles of cellular biology.	PO1, PSO1, PSO2
CO2	Understand the cells growth, division and death.	PO1, PO2, PO5, PSO1, PSO3
CO3	Utilize the skill in mechanism of cell signaling and how it regulates cellular functions.	PO5, PO6, PSO2
CO4	Relate the knowledge with how cellular dysregulation can lead to diseasecondition.	PO4, PO10, PO12, PSO1, PSO3
CO5	Identify cellular dysregulation.	PO5, PO12, PSO3

Course Outline:

Module –I Fundamentals of Cell Structure and Function:

Overview of Cells: History and Cell Theory: Key historical developments and basic principles. Structure and Function of Cell and its Organelles: Biological Membranes: Structure and function. Nucleus: Nuclear envelope, nucleolus. Mitochondria: Structure, function, and marker enzymes. Chloroplasts: Structure and function. Lysosomes, Glyoxysomes, and Peroxisomes: Structure, function, and marker enzymes.

Endoplasmic Reticulum: Rough and smooth ER, functions. Ribosomes: Structure and function. Golgi Complex: Structural organization, function, and marker enzymes. Cell Types: Prokaryotes vs. Eukaryotes: Key differences and characteristics. From Single Cell to Multicellular Organisms: Overview of cellular evolution. Different Molecules of the Cell: Water, Salt, and Mineral Ions: Importance and roles.

Project topics:

1. Comparative Study of Organelles: Structure and Function in Prokaryotic and Eukaryotic Cells
2. The Role of Mitochondria and Chloroplasts in Cellular Metabolism
3. Cell Membranes: Structure, Function, and Transport Mechanisms
4. The Role of the Endoplasmic Reticulum and Golgi Complex in Protein Synthesis and Modification

Module II: Cell Cycle and Cellular Communication

Cell Cycle and Its Regulation: Phases of the Cell Cycle: G0/G1, S, G2, and M phases.Cell

Division: Mitosis, meiosis, and cytokinesis. Regulation of the Cell Cycle: Key regulatory mechanisms. Cellular Communication and Mobility:

Cell Adhesion: Roles of different adhesion molecules. Gap Junctions: Function and importance. Extracellular Matrix (ECM): Structure and function.

Cell-Cell Interaction and Cell-ECM Interaction: Mechanisms and significance.

The Cytoskeleton: Components and functions. Microtubule-Based Movement and Microfilament-Based Movement: Mechanisms and roles.

Project Topics:

1. Regulation of the Cell Cycle: Key Checkpoints and Their Role in Cell Division
2. The Role of the Cytoskeleton in Cell Movement and Division
3. Extracellular Matrix (ECM) and Cell Adhesion: Mechanisms of Cell Communication
4. Mechanisms of Gap Junction Communication in Multicellular Organisms

Module III

Cell Signaling

Cell Signaling: Hormones and Their Receptors: Types and functions. Cell Surface Receptors: Overview and types. Signaling Through G-Protein Coupled Receptors (GPCR): Mechanisms and pathways. Tyrosine Kinase Receptors: Structure and function. Signal Transduction Pathways: Key pathways and their roles. Second Messengers: Types and functions. Regulation of Signaling Pathways: Mechanisms and importance. Bacterial and Plant Two-Component Systems: Overview and examples. Bacterial Chemotaxis: Mechanisms and significance.

Project topics:

1. Signaling Pathways: The Role of G-Protein Coupled Receptors in Cell Communication
2. Tyrosine Kinase Receptors in Cellular Signal Transduction
3. The Role of Second Messengers in Regulating Cellular Responses

Module IV: Programmemed Cell Death (Apoptosis)

Programmemed Cell Death (Apoptosis): Intrinsic Pathway: Mechanisms and key components. Extrinsic Pathway: Mechanisms and key components. Caspase Enzymes: Roles and functions. Regulation of Apoptosis: Importance in health and disease.

Project topics:

1. Mechanisms of Apoptosis: Intrinsic vs. Extrinsic Pathways

2. The Role of Caspase Enzymes in Programmemed Cell Death
3. Apoptosis and Disease: The Connection Between Programmemed Cell Death and Cancer
4. Regulation of Apoptosis in Development and Immune System Function

Module V: Cancer Biology

Cancer Biology: Development and Causes of Cancer: Overview and basic concepts.Tumor Viruses: Types and mechanisms. Oncogenes: Functions and roles in cancer.Tumor Suppressor Genes: Functions and roles in cancer.

Project topics:

1. The Role of Oncogenes in Cancer Development: Mechanisms and Pathways
2. Tumor Suppressor Genes: Their Functions and Implications in Cancer
3. The Impact of Tumor Viruses on Cellular Transformation and Cancer Development
4. The Relationship Between Apoptosis Dysregulation and Cancer Progression

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 Narosawww.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/.

BIOCHEMISTRY

Subject Name	Code	Type of course	T-P-Pj	Credit
Biochemistry	CUTM4286	Theory+ Practice	2-1-0	**3**

Course Objective:

- To explore the processes and pathways involved in the metabolism of carbohydrates and their significance in energy production.
- To comprehend the structure, function, and importance of amino acids and proteins in biological systems.
- To analyze the function and mechanisms of enzymes in facilitating and regulating metabolic reactions.
- To understand the roles of carbohydrates, proteins, and lipids in maintaining metabolic balance and overall physiological functions.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with PO & PSOs Mapping
CO1	List out the biochemical pathways leading to metabolism in the human body.	PO1, PO5 PSO1
CO2	Understand the significance of biomolecules in metabolic activities.	PO1, PO5, PSO1
CO3	Implement the knowledge of transformation of energy by the cells.	PO1, PO2, PO5, PSO1
CO4	Detects abnormal range of these molecules from patient samples.	PO5, PO5, PO7, PSO2
CO5	Evaluate the biochemical analysis of the patient samples.	PO1, PO2, PO4, PO5, PO7, PO9, PSO1, PSO2, POS3

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.

Practice: Estimation of Glucose in urine

Module- III

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 blood

Module- IV

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- V

Chemistry of Lipids & their related metabolism: Classification, biomedical importance, essentialfatty 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,Hypoglycemia & 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. Freemanand Company, New York. (e-Book link: https://www.pdfdrive.com/biochemistry-seventh-edition-e167675390.html)

Simulation links for labs:

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

RESEARCH METHODOLOGY

Subject Name	Code	Type	T + P + Pj	Credits
Research Methodology	CUTM1721	Theory+ Project	2+0+1	3

Course Objective:

- To gain a solid understanding of the fundamental concepts, types, and importance of research in scientific inquiry and academic fields.
- To learn how to formulate research problems, hypotheses, and objectives, as well as how to design and structure research projects.
- To understand and apply various methods of data collection, including surveys, experiments, interviews, and observation, while ensuring accuracy and reliability.
- To become proficient in using statistical tools and techniques for analyzing and interpreting data.

Course Outcome:

After completion of the course, the students will be able to,

COs	Statements	COs With POs and PSOs Mapping
CO1	Identify the key components of research, including its definition, scope, limitations, types, and objectives	PO1, PO6, PO12, PSO3
CO2	Understand the steps involved in developing a health research proposal.	PO2, PO3, PO4, PO9, PSO3
CO3	Implement the methods of data collection.	PO1, PO2, PO10, PO11, PSO2
CO4	Interpret the concepts of sampling designs, the theory of estimation and hypothesis testing, and the significance tests based on t, F, Z, and Chi-Square tests	PO2, PO5, PO13, PSO2, PSO3
CO5	Evaluate the importance of tabulation, coding, editing, interpretation, and report writing in the	PO7, PO9, PO12, PSO3

	research process.	

Course Outline:

Module- I

Introduction to Research**:** Definition, scope, limitations, and types of research. Objectives of Research**:** Types and importance. Research Process**:** Basic steps involved in the health research proposal development process. Literature Review**:** Importance, sources, strategies for accessing information, library and computer search techniques.

Project Topics:

1. Impact of Digital Library Systems on Literature Review Effectiveness in Health Research
2. Evaluating the Scope and Limitations of Research in Rural Healthcare Development
3. Comparative Study of Traditional vs. Modern Research Methods in Public Health

Module- II

Research Title and Objectives**:** Criteria for selecting a research title. Formulation of Research Objectives**:** Types and qualities of research objectives. Research Designs**:** Different types of research designs and their applicability to various research contexts.

Project Topics:

1. Exploring Factors Influencing Research Title Selection in Epidemiological Studies
2. Formulating Research Objectives for Preventing Lifestyle Diseases Among Urban Youth
3. Analyzing the Applicability of Experimental vs. Observational Research Designs in Community Health Projects

Module- III

Data Collection Methods**:** Secondary and primary data collection techniques. Scaling Techniques**:** Concept, types, rating scales, ranking scales, scale construction techniques, and multi-dimensional scaling. Sampling Designs**:** Concepts, types, techniques, and sample size determination.

Project Topics:

1. Effectiveness of Primary Data Collection Techniques in Monitoring Pandemic Outbreaks

2. Assessing Multi-Dimensional Scaling in Consumer Preferences for Health Products
3. Sampling Techniques in Determining Prevalence Rates of Non-Communicable Diseases

Module- IV

Research Hypothesis**:** Definition, qualities, importance, and types of hypotheses. Theory of Estimation**:** Testing of hypothesis, small and large sample tests. Statistical Tests**:** Tests of significance based on t, F, Z, and Chi-Square tests.

Project Topics:

1. Hypothesis Testing for the Impact of Yoga on Mental Health in Adolescents
2. Statistical Analysis of Health Outcomes in Smokers vs. Non-Smokers Using Chi-Square Tests
3. Small and Large Sample Testing to Study Vaccination Rates in Urban vs. Rural Areas

Module- V

Designing Questionnaire & Interviewing**:** Techniques for effective data collection. Tabulation, Coding, Editing**:** Organizing and processing research data. Interpretation and Report Writing**:** How to analyze results and prepare research reports.

Project Topics:

1. Designing Questionnaires to Assess Public Awareness of Reproductive Health
2. Developing an Interview Framework to Study Health-Seeking Behavior in Low-Income Communities
3. Tabulation and Statistical Interpretation of Survey Data on Patient Satisfaction in Hospitals

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.

CLINICAL PATHOLOGY

Subject Name	Code	Type of course	T-P-Pj	Credit
Clinical pathology	CUTM4327	Theory+ Practice	2-1-0	**3**

Course Objective:

- To develop a comprehensive understanding of the pathophysiological mechanisms underlying common diseases and disorders affecting different body systems.
- To acquire knowledge of various laboratory techniques and diagnostic tests used in clinical pathology, including hematological, biochemical, microbiological, and histopathological tests.
- To understand the principles of specimen collection, handling, processing, and the importance of quality control in clinical pathology.
- To apply theoretical knowledge to the identification of pathological changes in tissues and organs through microscopic and other diagnostic techniques.

Course Outcome:

After completion of the course, the students will be able to,

COs	Statements	COs With POs and PSOs Mapping
CO1	Execute the technique of collection of pathological specimens.	PO1, PO10, PO11, PSO2
CO2	Understand preservation and processing of pathological samples.	PO1, PO2, PO11, PSO1
CO3	Identify the causative agents of infectious diseases.	PO1, PO5, PO13, PSO1, PSO2
CO4	Interpret Gram staining and ZN staining results to diagnose respiratory infections, differentiate between amoebic and bacillary dysentery, and assess the presence of pathogens in various body fluids.	PO1, PO2, PO5, PO10, PO11, PSO2

CO5	Evaluate human abnormalities through clinical investigations.	PO1, PO4, PO5, PO8, PO11, PSO3

Course Outline:

Module-I

Physical & Chemical Examination of Urine: Sugar, ketone bodies, diabetes, nephritis, UTI, etc. Microscopical Examination of Urine: Including operation of the urine analyzer. Special Tests: Pregnancy test, multistix reagent strip, jaundice, albumin, phosphate, BJP, bile salt and pigment.

Lab & Practice: Benedict test, Rothera's test, Fouchet's test, urine analyzer operation, and other urine tests.

Module-II

Respiratory Tract Infection: Gram staining, ZN staining, and DOT centers. Sputum Analysis: For diagnosis of Mycobacterium tuberculosis. Clinical Significance & Report Writing: Sputum and respiratory infections.

Throat Swab Analysis: Bacteriological examination and clinical significance.

Lab & Practice: Gram staining, ZN staining, sputum analysis. Throat swab examination.

Module-III

Physical, Chemical, and Microscopical Examination of Stool: Including differences between amoebic and bacillary dysentery. Clinical Significance of Stool Examination: For parasitic and bacterial infections.

Lab & Practice: Stool analysis, occult test, protozoa and helminth identification.

Module-IV

Pleural, Pericardial, and Synovial Fluids: Composition, collection, and routine laboratory investigation. Cerebrospinal Fluid (CSF): Related to meningitis, brain tumors, and other disorders.

Lab & Practice: Collection and examination of pleural, pericardial, synovial fluids, and CSF.

Module-V

Semen Examination: Composition, and analysis for male infertility disorders.

Lab & Practice: Semen analysis, chemical and microscopical examination.

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 Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
3. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

BASKET II

DISCIPLINE CORE COURSES

HAEMATOLOGY

Subject Name	Code	Type of course	T-P-Pj	Credit
Hematology	CUTM4287	Theory+practical	3-1-0	**4**

Course Objective:

- To gain advanced knowledge of common hematologic diseases and their impact on blood cells and other blood components.
- To develop the ability to investigate hemorrhagic disorders and identify laboratory abnormalities such as anemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, and elevated ESR.
- To evaluate normal and abnormal cell morphology and associate these findings with specific diseases for clinical relevance.
- To acquire expertise in clinically relevant hematological analyses for a deeper understanding of blood components and their diagnostic significance.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Understand and identify various laboratory findings and associate them with clinical conditions.	PO1, PO2, PO5, PO7, PSO1
CO2	Demonstrate good skills in the relevant haematology methodology.	PO2, PO4, PO9, PSO1
CO3	Analyse various components of blood, their functions and roles in various diseases.	PO1, PO5, PO12, PSO1, PSO2
CO4	Evaluate blood components accurately and interpret results in alignment with established clinical guidelines.	PO2, PO5, PO7, PO12, PSO1, PSO2
CO5	Report findings from hematological investigations with precision, ensuring adherence to standard laboratory protocols and quality assurance measures.	PO4, PO6, PO9, PSO1, PSO2

Course Outline

Module- I

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

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

Hematological Disorders

Classification of Anemia: Morphological & etiological. Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings. Megaloblastic Anemia: Causes, Lab findings. 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

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 ofglass-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

Routine Hematological Tests:

Complete blood cell count, ESR, Differential Leukocyte count, Total leukocyte count, Bleeding timeand 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 Mukherjee, Publisher McGraw Hill education pvt. limited
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-practicee176384006.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=2ahUKEwja9ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=on epage&q=hematology&f=false
10. Ebooklink- 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

ANALYTICAL BIOCHEMISTRY

Subject Name	**Code**	**Type of course**	**T-P-Pj**	**Credit**
Analytical Biochemistry	CUTM4288	Theory+ Practice	3-1-0	**4**

Course Objective:

- To understand the principles and functioning of biochemical analyzing instruments, both automated and semi-automated, used in clinical laboratories.
- To learn the procedures for the proper care, maintenance, and handling of laboratory

equipment and chemicals to ensure optimal performance and safety.

- To familiarize with the normal reference ranges of key biochemical components in the human body, such as proteins, electrolytes, and hormones.
- To explore clinically relevant biochemical analysis techniques for a deeper understanding of the roles and clinical significance of biochemical components in health and disease.

Course Outcome:

After completion of the course, the students will be able to

COs	Statement	COs with PO & PSOs Mapping
CO1	Understand various tests carried out for biochemical analysis & Hormone investigations.	PO1, PO2, PO5, PO12, PSO1, PSO2
CO2	Know the application and handling of equipment in biochemical laboratory.	PO1, PO2, PO4, PO6, PSO1, PSO2
CO3	Perform analysis using semi-automated and fully automated biochemistry analyser.	PO2, PO4, PO5, PO9, PSO1, PSO2
CO4	Execute major biochemical investigations.	PO2, PO5, PO7, PO12, PSO1, PSO2, PSO3
CO5	Operate biochemical analysers.	PO2, PO4, PO6, PO9, PSO1, POS2

Course Outline

Module I: Chromatography Techniques

Chromatography Techniques: Paper Chromatography, Thin Layer Chromatography (TLC), Column Chromatography, Ion Exchange Chromatography, Affinity Chromatography, Gel Filtration Chromatography, Gas Chromatography (GC)

High-Performance Liquid Chromatography (HPLC), Fast Protein Liquid Chromatography

(FPLC)

Practice:

Handling of Equipment and Chemicals: Techniques for working with biochemical laboratory equipment and chemicals.

Module II: Electrophoresis Techniques

Electrophoresis Techniques: Moving Boundary Electrophoresis, Zone Electrophoresis (Paper and Gel), Immunoelectrophoresis, Isoelectric Focusing, 2-D Electrophoresis, Principle and Instrumentation: X-ray Diffraction (XRD) Nuclear Magnetic Resonance (NMR) Electron Spin Resonance (ESR)

Practice:

Estimate Erythrocyte Sedimentation Rate (ESR): Techniques for measuring the rate of erythrocyte sedimentation.

Module III: Automated and Semi-Automated Analyzers

Biochemistry Analyzers: Fully Automated Biochemistry Analyzer, Semi-Automated Biochemistry Analyzer, Coagulometer, Methods of Estimation and Assessment: Glucose Tolerance Test, Clearance Test for Renal Function, Gastric Analysis, Liver Function Test (LFT), Kidney Function Test (KFT), Lipid Profile, Qualitative Tests: Urobilinogens, Renal Calculi, Barbiturates, T3, T4, and TSH, 17-Ketosteroids

Principles and Procedures for Estimation: Acid Phosphatase, Alkaline Phosphatase, Lactate Dehydrogenase (LDH), Aspartate Transaminase (AST), Alanine Transaminase (ALT), Creatine Phosphokinase (CPK)

Practice:

Glucose Tolerance Test, Clearance Test, Gastric Juice Collection and Analysis

Kidney Function Test (KFT), Liver Function Test (LFT), Lipid Profile Tests for Renal Calculi and Hormones

Module IV: Advanced Instrumentation and Techniques

Principles and Applications of Advanced Techniques: X-ray Diffraction (XRD)

Nuclear Magnetic Resonance (NMR), Electron Spin Resonance (ESR)

Practice:

Estimate Erythrocyte Sedimentation Rate (ESR)

Module V: Clinical Chemistry and Diagnostic Tests

Clinical Chemistry Procedures:

Principles and Procedures of Automated and Semi-Automated Analyzers

Methods for Estimation of Various Biochemical Parameters: Glucose, Renal Function, Gastric Analysis, Liver Function, Lipid Profile, Hormones, and Enzymes

Clinical Significance of Enzyme Tests: Acid Phosphatase, Alkaline Phosphatase, LDH, AST, ALT, CPK

Practice:

Comprehensive Diagnostic Tests: Including glucose tolerance test, clearance test, gastric analysis, kidney and liver function tests, lipid profile, renal calculi analysis, and hormone tests.

Suggested readings:

1. Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology-Robert H.Carman. 2nd Edn. CMAI, New Delhi.
2. T ext 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. Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2008). **Lehninger Principles of Biochemistry** (5th ed.). W.H. Freeman and Company.
5. Voet, D., & Voet, J. G. (2011). **Biochemistry** (4th ed.). John Wiley & Sons.
6. Berg, J. M., Tymoczko, J. L., Gatto, G. J., & Stryer, L. (2019). **Biochemistry** (8th ed.). W.H. Freeman and Company.
7. Roy, A. K. (Year). **Biochemistry of Metabolic Processes**. Kalyani Publishers.
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=g bs_ge_sum mary_r&cad=0#v=onepage&q&f=false
10. Ebook link- https://books.google.co.in/books?id=csPcDAAAQBAJ&printsec=frontcover&source=gbs_ge_s ummary_r&cad=0#v=onepage&q&f=false

11. Ebook link- https://books.google.co.in/books?id=2FkXAwAAQBAJ&printsec=frontcover&source e=gbs_ge_ summary_r&cad=0#v=onepage&q&f=false

MOLECULAR BIOLOGY

Subject Name	Code	Type of course	T-P-Pj	Credit
Molecular Biology	CUTM1737	Theory + Project	3-0-1	**4**

Course Objective:

- To comprehend the molecular biology of cells, including their evolution, types, and structural organization of organelles
- To explore molecular mechanisms of cellular processes.
- To examine the molecular nature of genetic materials, including DNA and RNA structures, their replication, transcription, and translation processes.
- Understand the causes and mechanisms of human cancer, the role of tumor suppressor genes and oncogenes, and insights from genome research.

Course Outcome:

After completion of the course, the students will be able to:

COs	Statements	COs with POs and PSOs Mapping
CO1	Conceptually understand the central dogma of life.	PO1, PO5, PO12, PSO1, PSO3
CO2	Apply basic techniques of Molecular Biology in disease diagnosis.	PO2, PO5, PO7, PO12 PSO1, PSO2
CO3	Analyse molecular nature of human genome leading to oncogene formation.	PO1, PO5, PO12, PSO1, PSO2

CO4	Justify the concept of regulation of gene expression and metabolism.	PO1, PO5, PO10, PO12, PSO1, PSO3
CO5	Evaluate and compare molecular diagnostic techniques in relation to specific diseases.	PO2, PO5, PO6, PO12, PSO1, PSO2, PSO3

Course outline

Module I

Introduction: a. Introduction to molecular biology, b. Molecular biology of cell. Evolution and Molecular structure of cell and its organelles.

Module II

Types of cells. Including different kinds of Prokaryotic and eukaryotic cells, Cell growth, Cell adhesion, cell junctions and extracellular 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 III

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, RNA: Molecular structure, types. Evolution of DNA and RNA, Gene and genetic codes.

Project Topic: Tumor suppressor gene and oncogene.

Module IV

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 V

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.
4. E-book link - https://www.pdfdrive.com/molecular-cell-biology-lodish-5th-ed- e15674865.html

CYTOLOGICAL TECHNIQUES

Subject Name	Code	Type of course	T-P-Pj	Credit
Cytological Techniques	CUTM4289	Theory+ Practice	2-1-0	**3**

Course Objective:

- To understand the structure, function, and organization of cells, along with the techniques for preparing and analyzing cytological samples in medical and research applications.

- To learn to use various microscopy methods, including light, fluorescence, confocal, and electron microscopy, for identifying and analyzing cellular components.
- To acquire skills in applying diverse staining techniques to enhance visualization and analysis of cellular structures and functions.
- To develop the ability to critically evaluate cytological data for applications in research, diagnostics, and advancements in areas like cancer research, genetics, and infectious diseases.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Understand the significance of Cell Anatomy and Cytological Sampling	PO1, PO5, PSO1
CO2	Analyze cytogenetic and molecular methods, such as karyotyping, FISH, and PCR, to investigate genetic disorders, chromosomal abnormalities, and cellular anomalies.	PO5, PO6, PO12, PSO2
CO3	Perform staining techniques to distinguish between microorganisms.	PO2, PO3, PSO1
CO4	Evaluate the use of common and specialized staining techniques, such as H&E, PAS, and fluorescent stain. Apply the concept of pathogenicity in disease diagnosis.	PO5, PO7, PO10, PSO1, PSO2
CO5	Apply the ability to utilize various microscopy techniques.	PO2, PO5, PO9, PSO2

Course Outline:

Module I: Fundamentals of Cytology and Sample Preparation

Introduction to Cytology: Definition, scope, and importance in medicine and research.

Cell Structure and Function: Overview of cell organelles and differences between prokaryotic and eukaryotic cells.

Sample Collection and Preparation: Techniques for cell/tissue sampling, fixation, embedding,

and sectioning.

Practice:

1. Preparation of fixatives: Demonstrate the preparation of fixatives

- 95% ethyl Alcohol
- 50 % ethyl alcohol

Carnoy's fixative (P5)

2. Demonstrate cytological specimen preservation

Module II: Staining Techniques

Staining Principles: Importance in contrast enhancement and cellular component identification.

Common Stains: Hematoxylin and Eosin (H&E), PAS, Giemsa, Wright's stain.

Fluorescent Staining: Basics of fluorescent dyes in cytology.

Practice:

1. PAP staining: Prepare smear and perform PAP staining
2. Explain Diff-quick staining.

Module III: Microscopy Techniques

Light Microscopy: Brightfield and phase contrast microscopy. Advanced Microscopy: Fluorescence, confocal, transmission electron (TEM), and scanning electron microscopy (SEM).

Practice:

1. Demonstrate quality control in cytology laboratory (P5)

Module IV: Cytogenetic and Molecular Techniques

Karyotyping: Chromosome preparation and analysis. FISH: Principles and applications for genetic mapping and diagnosis. Molecular Cytology: PCR and in situ hybridization for detecting nucleic acid sequences.

Practice:

1. Perform karyotyping (P4)
2. Perform methylene blue staining for buccal smear

Module V: Modern Cytological Techniques and Clinical Applications

Cell Sorting: Flow cytometry and laser capture microdissection. Advanced Techniques:

Cytogenomics, advanced imaging. Clinical Applications: Diagnostic cytology in disease detection, especially cancer.

Practice:

1. Demonstrate receiving, handling and labelling of cytological specimen
2. Explain fine needle aspiration cytology
3. Demonstration of the specimen processing in cytology

- Gynaecological
- Urine
- Body fluids
- CSF
- Sputum

Suggested Readings:

1. Catherine M Keebler, Theresa M – Manual of Cytotechnolgy, 7th edition.
2. Edmund S. Cibas, Barbara S. Ducatman- Cytology- Diagnostic Principles and Clinical Correlations, 4th edition
3. Leopold G. Koss, Myron R. Melamed- Koss' Diagnostic Cytology and Its Histopathologic Bases.
4. John D. Bancroft- Bancroft's Theory and Practice of histological Techniques

BASIC COMPUTER AND INFORMATION SCIENCE

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

Course Objective:

- To gain knowledge about the roles and operations of various computer hardware components.
- To identify the key considerations for individuals and organizations when selecting and acquiring computer hardware based on specific needs and budgets.
- To learn methods for maintaining computer equipment and resolving common hardware

issues to ensure optimal functionality and longevity.

- To understand how hardware and software collaborate to perform computing tasks, alongside the principles of software development, categorization, and upgrading.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Understand the fundamental hardware components.	PO1, PO5, PSO3
CO2	Apply the concept in preparing documents.	PO8, PO9, PSO1,PSO3
CO3	Organize data's available digitally.	PO5, PO9, PSO3
CO4	Create presentations, formatting and enhancing texts	PO5, PO9, PSO3
CO5	Utilize the concepts and software skills in data handling.	PO5, PO8, PSO1, PSO2

Course Outline:

Module- I

Introduction to Computers: Basic Concepts, Introduction to Computers, Characteristics of Computers,Block Diagram of a Computer

Generations of Computers, Input and Output Devices, Types of Input Devices, Types of Output Devices, Processor and Memory, The Central Processing Unit (CPU)

Main Memory (RAM), Storage Devices, Types of Storage Devices, Functions and Uses

Module II: Introduction to MS-Word: Basics of MS-Word, Introduction to MS-Word, Components of the Word Window, Document Management, Creating, Opening, and Inserting Files, Editing a Document File, Page Setting and Formatting the Text, Saving the Document, Spell Checking, Printing the Document, Advanced Features, Creating and Editing Tables, Mail Merge

Module III:

Introduction to Excel: Basics of Excel, Introduction to Excel, About the Worksheet, Workbook Management, Entering Information, Saving Workbooks, Formatting the

Worksheet, Printing the Worksheet, Data Visualization, Creating Graphs

Module IV:

Introduction to PowerPoint and MS-DOS: Basics of PowerPoint, Introduction to PowerPoint, Creating and Manipulating Presentations, Views in PowerPoint, Formatting and Enhancing Text, Adding Slides with Graphs, Introduction to MS-DOS, History of MS-DOS, Features of MS-DOS, MS-DOS Commands (Internal and External)

Module V:

Introduction to Windows: Computer Networks, and the Internet, Introduction to Windows, History of Windows, Features of Windows, Desktop, Taskbar, Icons on the Desktop, Operations with Folders, Creating Shortcuts, Operations with Windows (Opening, Closing, Moving, Resizing, Minimizing, and Maximizing), Computer Networks, Introduction to Computer Networks, Types of Networks (LAN, MAN, WAN, Internet, Intranet), Network Topologies (Star, Ring, Bus, Mesh, Tree, Hybrid), Internet and Its Applications, Definition and Brief History of the Internet

Basic Services (E-Mail, File Transfer Protocol, Telnet, World Wide Web (WWW))

Web Browsers, Use of the Internet

Suggested readings:

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

MEDICAL LAW AND ETHICS

Subject Name	Code	Type of course	T-P-Pj	Credit
Medical Law and Ethics	CUTM1734	Theory+ Project	2-0-1	**3**

Course Objective:

- To provide students with a foundational understanding of ethics, with a particular focus on medical ethics, and to explore key ethical principles such as autonomy, which significantly influence medical law.
- To examine the general principles of medical law that govern the legal relationship between medical practitioners and their patients, ensuring that students grasp the legal

dynamics in healthcare settings.

- To analyze the legal implications of providing medical advice, diagnosis, and treatment, enabling students to understand the legal responsibilities and potential liabilities in medical practice.
- To investigate selected medico-legal issues over the course of human life, including reproductive technologies, fetal rights, research on human subjects, organ donation, rights of the dying, and the legal definition of death.

Course Outcomes:

After completion of the course, the students will be able to

COs	**Statements**	**COs with POs and PSOs Mapping**
CO1	Understand the Legal Framework Governing Medical Practice.	PO4, PO5, PSO1
CO2	Recognize Professional Responsibilities and Legal Obligations of Medical Practitioners.	PO4, PO9, PSO1
CO3	Analyze different types of medical negligence.	PO4, PO5, PSO3
CO4	Evaluate Legal Processes in Medical Malpractice Litigation.	PO4, PO5, PO9, PSO3
CO5	Assess the Medico legal risks in Healthcare Practice	PO4, PO5, PO10, PSO1

Course Outline:

Module-I

1. The Indian medical council act, 2. Medical council of India (functions), 3. Functions of state medical councils, 4. The declaration of Geneva, 5. Association of Healthcare Providers (AHPI) India

Module-II

1. Duties of medical practioners 2. Regarding Red Cross emblem 3. Professional secrecy 4. Privileged communication.

Module-III

1. Professional negligence 2. Medical mal occurrence 3. Contributory negligence 4. Criminal negligence 4. Corporate negligence 5. Ethical negligence 6. Precautions against negligence 7. difference between professional negligence and infamous conduct.

Module-IV

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

Module-V

1. Products liability 2. Medical indemnity insurance 3. Medical records 4. Consent in medical practice, 4. Euthenesia 5. Deaths due to medical care 6. Malingering

Suggested Readings:

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

2. Medical Law and Ethics in India" by KK Singh, 1st Edition (2018).

3. Medical Ethics Manual for Students" by Dr. Vijayaprasad Gopichandran and Dr. S.S. Lal, 1st Edition (2016).

Suggested Project Works:

1. Legal Responsibilities of Medical Professionals in Clinical Practice
2. Informed Consent: Legal and Ethical Implications in Treatment Process
3. Confidentiality and Data Protection in Hospitals: Legal Perspectives
4. The Role of Professional Codes of Conduct in Clinical Practice
5. Ethics: Balancing Patient Autonomy and Beneficence
6. Duty of Care and Negligence in Hospitals: Understanding Legal Accountability
7. Legal and Ethical Implications of Tele-Medicine Practice
8. The Impact of Medical Malpractice Laws on Clinical Practice

9. Regulatory Frameworks for Medical Practice in India
10. The Importance of Ethical Documentation in Clinical Practice
11. Patient Rights and Responsibilities: A Legal Perspective

MICROBIOLOGY

Subject Name	**Code**	**Type of course**	**T-P-Pj**	**Credit**
Microbiology	CUTM4290	Theory+ Practice	2-1-0	**3**

Course Objective:

- To learn about various types of culture media, their preparation, and applications in microbiology
- To acquire knowledge of microbial techniques for the isolation and identification of pure cultures of bacteria, fungi, and viruses.
- To gain expertise in performing aseptic techniques to handle microbial cultures safely and effectively during routine laboratory tasks.
- To implement appropriate sterilization methods and culture-handling procedures.

Course Outcome:

After completion of the course, the students will be able to

COs	**Statements**	**COs with POs and PSOs Mapping**
CO1	Understand the significance of microbial cell organelles.	PO1, PO5, PSO1
CO2	Apply the concept of pathogenicity in disease diagnosis.	PO5, PO7, PO10, PSO1, PSO2
CO3	Perform staining techniques to distinguish between microorganisms.	PO2, PO3, PSO1, PSO2
CO4	Justify the use of different culture media for the	PO5, PO6, PSO1, PSO2

	growth of variouspathogenic microbiota.	
CO5	Apply the concept of pathogenicity in disease diagnosis	PO5, PO7, PO10, PSO1, PSO2

Course Outline:

Module –I: Introduction to Microbiology and Bacterial Anatomy

Microbiology: Definition, history, and host-microbe relationship

Safety measures in a microbiology laboratory

Bacterial anatomy: Bacterial cell structure including spores, flagella, pili, and capsules

Sporulation

Practice:

Handling of the microscope

Module-II: Growth and Nutrition of Microbes

General nutritional requirements of bacteria

Bacterial growth curve

Practice:

Inoculation techniques for bacteria on culture media

Module-III: Sterilization Techniques and Equipment

Sterilization: Definition, sterilization by dry heat, moist heat (at, above and below 100°C)

Use of Autoclave and Hot air oven

Radiation, Filtration, preventive measures, controls, and sterilization indicators

Practice:

Preparation and use of sterilization equipment

Module-IV: Staining Techniques

Simple staining: Methylene blue

Gram staining

Practice:

Demonstration of Gram stain and special stains (spore, capsule)

Module-V: Culture Media and Antibiotic Susceptibility Testing

Types of culture media: Liquid, solid, routine laboratory media (basal, enriched, selective)

Preparation of culture media for microbial growth

Practice:

Preparation of different types of culture media

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

SYSTEMIC VIROLOGY & MYCOLOGY

Subject Name	Code	Type of course	T-P-Pj	Credit
Systemic Virology & Mycology	CUTM4293	Theory+ Practice	3-1-0	**4**

Course 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.
- To use insights from microbiology to develop strategies for preventing and managing infections effectively in clinical and public health settings.

Course Outcome:

After completion of the course, the students will be able to:

COs	Statements	COs with POs and PSOs Mapping
CO1	Understand the classification, morphology and pathogenicity of virus and fungi.	PO1, PO5, PSO1, PSO2
CO2	Know the serological techniques and their utilization.	PO1, PO2, PO5, PSO1
CO3	Perform laboratory investigations for the diagnosis of diseases caused by virus and fungi.	PO2, PO5, PO7, PSO1, PSO2
CO4	Analyse different culture techniques used to propagate human virus.	PO5, PO6, PSO2
CO5	Evaluate the severity of viral and fungal infection based on diagnostic results.	PO5, PO7, PO10, PSO1, PSO2

Course Outline:

Module-I

Structure, cultivation and properties of Viruses. Classification of Medically Important Viruses.

Geneticmaterial, Organ system involved, Transmission.

Practice:

1. Demonstration of virus isolation techniques.

Module- II

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

Practice:

2. Demonstration of cell and tissue culture techniques used for virus isolation

Module- III

Morphology, Epidemiology, Pathogenesis, Treatment, laboratory diagnosis, Prevention and Control of Viral Diseases (RNA Viruses) *Orthomyxoviridae, Paramyxoviridae, Picornaviridae, Corona viridae, Rhabdoviridae, Retrovirida.*

Practice:

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

Module-IV

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:

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

Module-V

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:

1. Slide culture technique for Superficial infections
2. Culture and identification of yeasts
3. 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)

EPIDEMIOLOGY

Subject Name	**Code**	**Type of course**	**T-P-Pj**	**Credit**
Epidemiology	CUTM1746	Theory+Project	2-0-1	**3**

Course 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.

Course Outcome:

After completion of the course, the students will be able to:

COs	**Statements**	**COs with POs and PSOs Mapping**
CO1	Know the basic principles, methods and study designs in epidemiology.	PO1, PO5, PO12, PSO1, PSO3
CO2	Demonstrate the role of various determinants in health-related events.	PO5, PO7, PO10, PSO3
CO3	Illustrate the key features and application of descriptive and analytical epidemiology.	PO1, PO5, PO10, PSO3
CO4	Review various studies and interpret the data.	PO1, PO5, PO12, PSO3

CO5	Develop Public health policies.	PO6, PO10, PO11, PO12, PSO3

Course Outline

Module-I

Introduction to Principles of Epidemiology: History, Definition, and scope of epidemiology, Achievements in epidemiology, Terms & Terminologies used in epidemiology.

Project Topic: Prevalence of Diabetes and its Associated Rish Factors with Sex and Age Group of 35-45 Years and Treatment or Prevention

Module-II

Measuring Health and Disease: Definitions of health and disease, Measures of disease frequency Use of available information, Comparing disease occurrence.

Project Topic: Epidemiology of typhoid

Epidemiology of chickenpox

Module-III

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.

Project Topic: Epidemiology of influenza virus

Module-IV

Communicable disease epidemiology, Clinical epidemiology, Environmental & occupational epidemiology, Nutritional epidemiology, Reproductive epidemiology, Social epidemiology, Food epidemiology.

Project Topic: Epidemiology of bronchitis

Module-V

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.

Project Topic: Epidemiological aspect of Hypertension

Epidemiology of hyperthyroidism

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.

IMMUNOLOGY

Subject Name	Code	Type of course	T-P-Pj	Credit
Immunology	CUTM4295	Theory + Practice	3-1-0	**4**

Course Objective:

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- To study the types and biological classes of antigens, antigen-antibody interactions, and the structure and function of different immunoglobulin classes.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.
- To understand the mechanisms of complement activation, its biosynthesis, quantification, and the implications of complement deficiencies.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs With POs and PSOs Mapping
CO1	Understand the concept of Innate & adaptive	PO1, PO5, PO12, PSO1

	immunity.	
CO2	Apply application of immunology in disease diagnosis.	PO1, PO5, PO10, PSO1, PSO2
CO3	Analyse clinically relevant serological samples for Ag- Ab interaction.	PO1, PO2, PO11, PSO2
CO4	Justify and interpret diagnostic results of patient sample.	PO2, PO5, PO11, PSO2, PSO3
CO5	Interpret types of Hypersensitivity reactions.	PO1, PO5, PO8, PSO1, PSO3

Course Outline

Module-I

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity.

Module-II

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-III

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

Practice: Performing Serological tests: Widal test, VDRL test, ASO test, C-Reactive Protein test, Rheumatoid factor (RF) test

Module-IV

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

Practice: Performing Precipitation in agarose gel

Performing Ouchterlony Double diffusion test Demonstration of SDS-PAGE

Module-V

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.

Practice: Demonstration of ELISA

Demonstration of Western blotting

Suggested Readings:

1. Kuby's Immunology (7th Ed) - by J. Owen, J. Punt, S. Strandford. Macmillan HigherEducation, 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 Universitiespress.

(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. BlackwellScience.

(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

(Courseware link: https://www.coursera.org/learn/immunologyfundamentalstcellssignaling)

MEDICAL INSTRUMENTATION AND TECHNIQUES

Subject Name	Code	Type of course	T-P-Pj	Credit
Basic Medical Instrumentation and Techniques	CUTM1730	Theory+Practice	2-2-0	**4**

Course Objective:

- To study the principles, instrumentation, specimen preparation, and applications of advanced microscopic techniques
- To learn the principles, working mechanisms, and applications of key laboratory instruments.
- To understand the principles of microtomy, including tissue sectioning and staining techniques, and gain insights into the operation of fully and semi-automated biochemistry analyzers.
- To acquire knowledge of the principles, working mechanisms, and uses of clinical and sterilization instruments.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Describe the working mechanisms of advanced microscopes, spectrophotometers, and centrifuges, including their scientific applications.	PO1, PO5, PO12, PSO1, PSO2
CO2	Operate and maintain laboratory equipment like	PO2, PO4, PO5, PSO2

	UV-Vis spectrometers, centrifuges, and laminar airflow systems with accuracy and quality control.	
CO3	Evaluate results from spectrophotometric analyses, centrifugation, and tissue sectioning to ensure precision and reliability in experimental procedures.	PO5, PO7, PO12, PSO1, PSO2
CO4	Implement safe and effective usage protocols for instruments like autoclaves and incubators, contributing to optimal laboratory and clinical operations.	PO2, PO4, PO10, PSO2, PSO3
CO5	Interpret and diagnose diseases result.	PO1, PO5, PO7, PSO1, PSO3

COURSE OUTLINE

Module-I

Microscopic techniques: Principle, Instrumentation, Specimen preparation and Application: Phase– contrast microscopy, fluorescene microscopy, polarization microscopy, electron microscopy (Scanning and Transmission);

Module-II

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- III

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- IV

Microtomy: Sectioning, Staining. Application, Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser,

Module-V

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'sMicrobiology. 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-Booklink-
https://books.google.co.in/books?id=z9SzvsSCHv4C&printsec=frontcover&dq=instrumentation&hl=en&sa=X&ved=2ahUKEwjipqrO347qAhUjwzgGHRomCNUQ6wEwAHoECAIQAQ#v=onepage&q=instrumen tation&f=f alse)

VITAMINS AND HORMONES

Subject Name	Code	Type	T + P + Pj	Credits
Vitamins and Minerals	CUTM4292	Theory+ Practice	2-2-0	4

Course Objective:

- To provide students with a comprehensive understanding of the daily nutrition requirements for vitamins and minerals and their role in maintaining overall health.
- To enable students to identify and evaluate various food sources rich in essential vitamins and minerals, promoting informed dietary choices.
- To explore the physiological and health impacts of vitamin and mineral deficiencies and excesses, including the identification of associated health conditions.
- To equip students with the skills to analyze dietary patterns and develop practical strategies for optimizing vitamin and mineral intake in diverse populations.

Course Outcome:

After completion of the course, the students will be able to

COs	**Statements**	**COs with POs and PSOs Mapping**
CO1	Identify and list the essential vitamins and minerals, along with their food sources and functions in the human body.	PO1, PO10, PSO1
CO2	Demonstrate the biochemical roles of key vitamins and minerals, including their impact on health and metabolism.	PO1, PO5, PO7, PSO1
CO3	Analyze dietary intake and create a balanced meal plan that meets recommended daily allowances of vitamins and minerals for specific populations.	PO5, PO9, PO10, PSO3
CO4	Evaluate the effects of vitamin and mineral deficiencies and excesses on health, including common disorders associated with imbalances.	PO1, PO5, PO7, PO12 PSO1, PSO3
CO5	Design an educational Programme to promote awareness of the importance of vitamins and minerals in diet, targeting specific demographic groups such as children, athletes, or the elderly.	PO6, PO9, PO10, PSO3

Course Outlines:

Module 1: Vitamin Classification

Overview and Classification of Vitamins: Study of fat-soluble and water-soluble vitamins, their differences, and general roles.

Practical: Vitamin Solubility Test

Module 2: Fat-Soluble Vitamins

Chemistry, Properties, and Deficiency of Fat-Soluble Vitamins: Exploration of vitamins A, D, E, and K—chemical structures, functions, and the effects of deficiencies.

Practical: Vitamin A Detection Test,

Perform a color reaction using iodine to detect vitamin A in food samples.

Module 3: Water-Soluble Vitamins

Chemistry, Coenzyme Functions, and Deficiency of Water-Soluble Vitamins: Focus on the B-complex and vitamin C, their roles as coenzymes, and deficiency-related diseases.

Practical: Vitamin C Titration

Measure the vitamin C content in fruit juices using an iodine titration method.

Vitamin B Detection with pH Indicator

Use a pH indicator to detect B vitamins, noting color changes that indicate their presence.

Module 4: Hormone Basics

Classification, Action Mechanism, and Secretion Regulation of Hormones: Study of hormone types, how they act on target cells, and how their release is controlled.

Practical:

Blood Glucose Measurement

Measure blood glucose levels before and after eating, illustrating insulin secretion and regulation by the pancreas.

Module 5: Specific Hormones and Functions

Chemistry, Metabolism, and Disorders of Key Hormones: Detailed study of hormones from the hypothalamus, pituitary, thyroid, parathyroid, pancreas, adrenal glands, and gonads, including their functions and related disorders.

Practical:

Thyroid Function Test

Cortisol Measurement Test

Suggested Readings:

1. Vitamins and Hormones" (Series) - edited by Gerald Litwack
2. "The Vitamins: Fundamental Aspects in Nutrition and Health" by Gerald F. Combs Jr.
3. "Principles of Hormone/Behavior Relations" by Donald W. Pfaff
4. "Vitamins: Their Role in the Human Body" by G. F. M. Ball
5. "Hormones" by Anthony W. Norman and Helen L. Henry
6. "Handbook of Vitamins" by Janos Zempleni, John W. Suttie, Jesse F. Gregory III, and Patrick J. Stover

HISTOPATHOLOGY AND CYTOLOGY

Subject Name	Code	Type	T + P + Pj	Credits
Histopathology and Cytology	CUTM4323	Theory + Practice	2+1+0	3

Course Objective:

- To introduce the organization and essential equipment of a histology laboratory
- To discuss various fixatives, including simple, compound, and special fixatives, used for preserving tissue elements.
- To demonstrate the use of instruments like tissue processors, microtomes, and tissue baths.
- To perform manual and automated techniques for tissue processing and cytology

Course Outcome:

After completion of the course, the students will be able to

Cos	Statements	COs With POs and PSOs Mapping
CO1	Identify the essential equipment used in histopatho technology, the types of fixatives and stains.	PO1, PO10, PSO2
CO2	Understand the criteria for selecting	PO1, PO2, PO10, PSO2

	decalcification agents and the components of various fixatives.	
CO3	Execute different staining techniques, including Periodic Acid Schiff staining, Hematoxylin and Eosin staining, and special stains, in enhancing the visibility of tissue structures	PO1, PO2, PO10, PSO2
CO4	Apply their knowledge to demonstrate the correct histo-technique for examining various types of tissues.	PO2, PO5, PO10, PSO2
CO5	Assess the importance of proper maintenance, labeling, and safety practices in a cytology laboratory.	PO5, PO8, PO11, PSO2

Course Outline:

Module- I

Organization of histology laboratory – Histological equipments, reception and recording of tissue specimens. 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

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

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 mortem technique (Hospital Visit).

Module- IV

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.

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

Practice: Preparation of various Fixatives, Labeling of Histological specimens, Embedding and Casting of block. Processing of tissue by manual and automated processor method. To demonstrate various part and types of microtome.

Module- V

Collection, preservation, fixation and processing of various cytological specimens. Preparation and quality control of various reagents and stains used in cytology. Cytology of female genital tract, urinary tract, gastrointestinal tract, respiratory tract, effusions and miscellaneous fluids. FNAC – method of aspiration, slide preparation, fixation and staining of smears. Automation in cytology.

Practice: PAP staining, H/E staining

Suggested Readings:

1. Color text book of histology by Gartner &Hiatt, publisher Elsevier
2. Netter's essential histology by William Ovalle, publisher Elsevier
3. Histology E-book by Barry Mitchell, publisher Elsevier
4. Textbook of Histology (color atlas) by Krishna Garg, Indira Bahl, Mohini kaul, publisher CBS

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. E book link https://books.google.co.in/books?id=qWScAQAAQBAJ&printsec=frontcover &sourc e=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
8. E book link https://books.google.co.in/books?id=MrpEDwAAQBAJ&printsec=frontcover &sourc e=gbs_ge_ summary_r&cad=0#v=onepage&q&f=false
9. E book link https://books.google.co.in/books?id=CERPDwAAQBAJ&printsec=frontcover&sou rc e=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

ADVANCED HEMATOLOGY

Subject Name	Code	Type	T + P + Pj	Credits
Advanced Hematology	CUTM4330	Theory+Practice	2+1+0	3

Course 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:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Understand the use of basic equipment essential for working in a hematology laboratory.	PO1, PO6, PO10, PO11, PO12, PSO1, PSO3
CO2	Perform investigations of bleeding disorders.	PO1, PO2, PO5, PO10, PO11, PO13, PSO1, PSO2, PSO3
CO3	Compare and contrast hematology values under normal and abnormal conditions.	PO1, PO2, PO5, PO8, PO11, PO12, PO13, PSO1, PSO2, PSO3
CO4	Evaluate the process of bone marrow processing and staining.	PO2, PO3, PO5, PO10, PO11, PO12, PO13, PSO1, PSO3
CO5	Compare and contrast hematology values under normal and abnormal conditions.	PO1, PO2, PO5, PO8, PO11, PO12, PO13, PSO1, PSO2, PSO3

Course Outline:

Module-I

Quality assurance in hematology, 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: Data and record Maintain, Handling, hematological equipments.

Module-II

Bone marrow: Composition, processing, functions and examination (differential cell counts and cellular ratios)., Aspiration of bone marrow (Adults and children), Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black,staining of trephine biopsy specimens.
Practice: Method of aspiration bone marrow, method of Processing and staining of trephine biopsy.

Module-III

L.E. cell phenomenon. Definition of L.E. cell, Demonstration of L.E. cell by various methods, Clinical Physiological variations in Hb, PCV, TLC and Platelets. Investigations of a case

suffering from bleeding disorders. Quantitative assay of coagulation factors - a. Principle b. Procedure c. Mechanism d. Tests Biomedical waste management in hematology laboratory (Other than Radioactive material)

Practice: Demonstration of functional aspect of blood cell counter Study the RBCs abnormal morphological , Immature Erythroid series of cells,Immature Myeloid and other WBCs series of cells

Module-IV

Leukemia: Classification, Laboratory diagnosis of leukemia's, Blood Picture, Advanced techniques in the diagnosis of leukemia, Identification of abnormal blast cells, Evaluation of differential leukocyte counts. Techniques for processing bone marrow samples. Differentiation of Blast Cells.

Practice: Blood Smear Preparation and Examination, Differential Leukocyte Count (DLC)

Module-V

Investigation of bleeding disorders and quantitative assays of coagulation factors. Principles, procedures, mechanisms, and tests for coagulation factor assays, Tests of coagulation disorders – Screening tests – PT, APTT, Thromboplastin time & thrombin time. Second line tests – mixing experiments, factor assays FDP

Practice: PT, APTT, Thromboplastin time & thrombin time, Differentiation of blast cells in leukemia. Analysis of bone marrow differential counts.

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. E.Book link- https://www.pdfdrive.com/hematology-basic-principles-and-practice- e176384006.html
8. E. Book 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. E.Book link https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology
10. &hl=en&sa=X&ved=2ahUKEwja9ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ# v=onepage&q=hematology&f=false\
11. E.book link- https://books.google.co.in/books?id=QQcYAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9ve3I7qAhUwzTgGHSMUDekQ6wEwAnoECAIQAQ #v=onepage&q=hematology&f=false

APPLIED HEMATOLOGY

Subject Name	Code	Type	T + P + Pj	Credits
Applied Hematology	CUTM4313	Theory + Practice	2 + 2 + 0	4

Course Objective:

- To gain advanced knowledge of common hematologic diseases and blood components.
- To understand the characteristics, functions, and abnormalities of human blood cells.
- To develop proficiency in performing accurate blood cell counts and evaluations.
- To ensure proper handling and disposal of hematology specimens in biohazard containers.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Understanding of Haemopoietic disorders and their laboratory diagnosis.	PO1, PO5, PO12, PSO1
CO2	Be able to collect and process samples according to the required tests to be done	PO2, PO9, PO11, PSO1
CO3	Apply the knowledge for the laboratory diagnosis of leukemia, hemolytic anemia, hemophilia, ITP, L. E. cell phenomenon.	PO1, PO2, PO5, PSO1
CO4	Examine blood samples for CBC, TPC, APTT, PT.	PO2, PO5, PO8, PSO2
CO5	Investigate blood elements within stated limits of accuracy	PO2, PO5, PO6, PSO2

Course Outline:

Module I: Laboratory Diagnosis of Anemias

Definition and Laboratory Diagnosis of Leukaemias, Laboratory Diagnosis of Leukamoid Reactions **Cytochemical Staining:** Procedure, Significance in Various Hemopoietic Disorders

Laboratory Diagnosis of: Iron Deficiency Anaemia, Megaloblastic Anaemia, Hemolytic Anaemia **Practice:** Collection of Blood from Different Body Parts, Data and Record Maintenance, Handling Hematological Equipment, Demonstrate Different Abnormal Morphology of RBCs in Anaemia Cases

Module II: Chromosomal Studies and Fibrinolysis

Chromosomal Studies in Various Hematological Disorders and Their Significance, Mechanism of Normal Fibrinolysis, 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: Hemophilia, von Willebrand Disease, and Platelet Function

Laboratory Diagnosis of: Hemophilia, von Willebrand Disease, 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: Measurement and Estimation Techniques

Blood Volume, Red Cell Volume, Plasma Volume, Red Cell Life Span, Platelet Life Span, Serum Iron, Total Iron Binding Capacity, Plasma and Urine Hemoglobin, Hb-S by Sickling and Solubility Tests, Various Platelet Function Tests

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

Module V: Study related to Red cell disorders

Red Blood cell indices and its interpretation, Iron Transport and estimation of Serum Iron and Total Iron Binding Capacity, Types of Hemoglobin, Sickle Cells, Estimation of Hb-F.

Practice: Demonstration of Sickle Cells, Estimation of Serum Iron and Total Iron Binding Capacity, Estimation of Hb-F in a Given Blood Sample, Estimation of Plasma and Urine Hemoglobin in Given Specimens, Demonstration of 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 of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
2. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
3. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
4. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
5. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.

MEDICAL LABORATORY MANAGEMENT

Subject Name	Code	Type	T - P - Pj	Credits

MEDICAL LABORATORY MANAGEMENT	CUTM4317	Theory+ Project	3-0-1	4

Course Objective:

- To explain and apply principles of effective test utilization in laboratory settings.
- To interpret and comply with laws, regulations, and standards from government and non-government organizations.
- To design, implement, and evaluate laboratory resources and processes.
- To communicate effectively with laboratory personnel and healthcare professionals.

Course Outcome:

After completion of the course, the students will be able to

COs	**Statements**	**COs , POs and PSOs Mapping**
CO1	Understand and exhibit a sense of commitment to the ethical and human aspect of patient care.	PO4, PO11, PSO1
CO2	Implement government regulations and safety standards in medical laboratory practice.	PO2, PO4, PO6 PSO2
CO3	Organizing and management of lab records.	PO2, PO6, PO9, PSO1
CO4	Maintain good lab practice and culture of transparency	PO2, PO4, PO6 PSO2
CO5	Design a laboratory set up using principles of intelligent design minimizing chances of error.	PO5, PO6, PO10, PSO

Course Outline:

Module I: Laboratory Ethics and Safety

Ethics of Pathological Clinics; Code of Conduct for Medical Laboratory Personnel; Safety Measures in the Laboratory; Organization of Pathology Laboratory under Board of Quality Control; Clinical Laboratory Science; Functional Components of the Clinical Laboratory; Standardized Clinical Laboratory Setup; Various Types of Laboratories; PPE in Labs; Important Instructions to Minimize Infection in Laboratory Workers

Practice: PPE Practice; Lab Setup; Sample Collection and Preservation

Module II:

Laboratory Reporting and Sample Management

Release of Laboratory Reports; Clinical Alerts; Reporting Results: Basic Format of Pathology Reports; Transportation and Preservation of Lab Samples; 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 III:

Quality Management Systems

Quality Management System; NABL Policy; Clinical Establishment Act Policy; Annual Maintenance Contract for Laboratory; General Safety Precautions in Case of STD and Drug-Resistant Tuberculosis

Practice: Management Information System

Module IV:

Procurement and Supply Management

Procurement and Supply Management; Different Types of Laboratory Record Management; Laboratory Information Management System (LIMS)

Practice: Procurement Management

Module V:

Financial and Regulatory Aspects

Profit and Loss Analysis; WHO Policy for Medical Labs

Practice: 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

IMMUNOPATHOLOGY

Subject Name	Code	Type	T - P - Pj	Credit
Immunopathology	CUTM4314	Theory+ Practice	2-1-0	**3**

Course Objective:

- To understand the components and functioning of the immune system.
- To learn defense mechanisms against pathogens including viruses, bacteria, and parasites.
- To explore the pathogenesis of immune diseases such as hypersensitivity, autoimmunity, and immunodeficiencies.
- To gain knowledge of immunological techniques used in research and diagnostics.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Describe the organization and functioning of the immune system.	PO1, PO5, PO7, PSO1
CO2	Investigate immunological aspects of clinically significant diseases.	PO1, PO2, PO5, PO7, PSO2, PSO3
CO3	Understand the various immune system related disorders	PO1, PO7, PO10, PSO1, PSO3
CO4	Apply the principle of diagnostic tests associated with immunological techniques.	PO2, PO5, PO12, PSO1, PSO2
CO5	Relate the fundamental stages of immune system with the changes over the course of life.	PO1, PO7, PO8, PSO3

Course Outline:

Module-I

Basic Components of the Immune System, Immune Regulation, Immunological Aspects of Infection, The immune response to viral, bacterial, and parasitic infections.

Practice:

Studying the Immune Response to Bacterial Infections Using Antibody Assays

Isolation and Identification of Immune Cells from Peripheral Blood

Module-II

Immunological Aspects of Immunodeficiency Diseases, 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.

Practice:

Detection of Autoantibodies in Autoimmune Disorders Using Indirect Immunofluorescence

Assessment of IgE Levels in Allergic Conditions Using ELISA

Module-III

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).

Practice:

Evaluating Cytokine Levels in Rheumatoid Arthritis Patients

Immune Profiling in Pulmonary Tuberculosis Using Flow Cytometry

Module-IV

Immunological aspects of organ transplantation, Mechanisms of graft rejection (hyperacute, acute, and chronic rejection), immunosuppressive therapies, Antitumor Immune Response.

Practice:

Histological Analysis of Graft Rejection in Transplanted Tissues

Assessment of Tumor-Infiltrating Lymphocytes in Cancer Using Immunohistochemistry

Module V

Immunological Techniques in Diagnostics, Applications of techniques like ELISA, Flow

Cytometry, and Immunohistochemistry in diagnosing immune-related disorders

Practice:

Performing ELISA for Detecting Antibodies in Autoimmune or Infectious Diseases

Flow Cytometry-Based Analysis of T-Cell Subsets in Immunodeficiency Disorders

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 McGrawHill education

4. Medical Laboratory manual for tropical countries Vol II Microbiology byMoniaCheesbrough, publisher Butterworth Heinemannltd

5. Immunology by Ivan Roitt, Jonathaan Brostoff and David Male.

BLOOD BANKING

Subject Name	Code	Type	T + P + Pj	Credits
Blood Banking	CUTM4329	Theory+ Practice	2+1+0	3

Course Objective:

- To understand blood bank methods and demonstrate knowledge of testing procedures.
- To learn about anticoagulants used in blood banks.
- To Gain knowledge of blood regulation policies and their implementation.
- To explain solid organ transplantation, related policies, and transfusion reactions.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs

		Mapping
CO1	Understand the basic principle of blood banking.	PO1, PO6, PO10, PO11, PO12, PO13, PSO3
CO2	Perform blood group systems, including ABO and Rhesus systems.	PO1, PO2, PO5, PO10, PO11, PO13, PSO1, PSO3
CO3	Demonstrate auto mentation technique used in blood bank.	PO1, PO2, PO5, PO8, PO10, PO11, PO12, PO13, PSO1, PSO3
CO4	Evaluate pre-transfusion testing protocols, compatibility tests, cross-matching procedures, and precautions for blood component infusion.	PO1, PO2, PO3, PO5, PO8, PO10, PO11, PO12, PO13, PSO1, PSO2, PSO3
CO5	Investigate transfusion reactions.	PO1, PO2, PO3, PO5, PO6, PO8, PO10, PO11, PO12, PO13, PSO2, PSO3

Course Outline:

Module-I

Basic principle in blood banking, Blood bank organisation, Planning and documentation,NACO Blood bank policy, National blood policy, Equipment used in blood bank. Anticoagulantuse in blood bank, Selection of blood donor

Practice: Documentation process, Setting up a blood bank, Operation of blood bank equipment.

Module-II

Automation technique used in blood bank, Techniques used for the separation of blood constituent, 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, Rhesus and human blood group system

Module-III

Blood transfusion alternative, Prevention of diseases transmitted through blood transfusion,

Transfusion reaction investigation, Transfusion reaction, Precaution taken for infusion of blood components, Pre- transfusion

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

Module-IV

Blood transfusion in solid organ transplantation, Exchange of blood transfusions, pre-surgical blood transfusion planning, blood and blood component transfusions, selection of appropriate blood components, apheresis and hemapheresis techniques

Practice: Planning and documenting blood transfusions for solid organ transplant patients.

Module-V

Blood regulation policies, NACO guidelines for blood bank operations, National and international blood donation policies, Quality control measures in blood banks, Role of red cross society in blood bank.

Practice: Analysis of blood bank regulations and quality control.

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%20B lood %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

HEALTH PROGRAMMEME IN INDIA

Subject Name	Code	Type	T - P - Pj	Credits
Health Programmeme in India	CUTM4318	Theory+ Project	3-0-1	4

Course Objective:

- To understand the efficiency of health education and health promotion Programmemes.
- To know efficiency and effectiveness for Health care industry.
- To think and improving access to and efficiency of primary health care.
- To explain various health Programmeme in India.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Identify health policies for improvement of overall health and well-being in India.	PO1, PO6, PO8, PO9, PO13,PSO3
CO2	Understand the principle of public health.	PO1, PO8, PO10, PO12, PO13, PSO2, PSO3
CO3	Apply their understanding by identifying the objectives and goals of various health Programmes	PO2, PO3, PO5, PO9, PO11, PSO2, PSO3, PSO2, PSO3
CO4	Demonstrate the skills required to work towards the development of health conditions in underserved areas of India.	PO4, PO5, PO8, PO10, PO11, PO13, PSO2, PSO3
CO5	Create awareness regarding women and child welfare.	PO6, PO7, PO8, PO9, PO12, PSO3

CO1: Identify health policies for improvement of overall health and well-being in India.

CO2: Understand the principle of public health.

CO3: Apply their understanding by identifying the objectives and goals of various health Programmes

CO4: Demonstrate the skills required to work towards the development of health conditions in

underserved areas of India.

CO5: Create awareness regarding women and child welfare.

Course Outline

Module I

Introduction to Health Programmemes in India, Voluntary Health Agencies in India, Indian Red Cross Society, Central Social Welfare Board, Indian Council for Child Welfare.

Projects:

Role of Voluntary Health Agencies in Strengthening Public Health in India

Impact of Indian Red Cross Society on Disaster Relief and Health Services

Module II

Family Planning Association of India, National Programmeme for Control of Blindness, National Tuberculosis Programmeme.

Projects:

Evaluation of the National Programmeme for Control of Blindness: Success and Challenges

Effectiveness of the National Tuberculosis Programmeme in Urban vs. Rural India

Module III

National Leprosy Eradication Programmeme, National Programmeme for Health Care of Elders.

Projects:

Assessment of the National Leprosy Eradication Programmeme: Progress Towards Elimination

Healthcare Needs and Challenges in Implementing the National Programmeme for Health Care of Elders

Module IV

National Programmeme for Prevention and Control of Cancer, Diabetes, Cardiovascular Disease.

Projects:

Community Awareness and Implementation of the National Cancer Prevention Programmeme

Integrated Approach to Prevent and Control Diabetes and Cardiovascular Diseases in India

Module V

National Immunization Programmeme, AYUSH - Objectives and Goals.

Projects:

Impact of the National Immunization Programmeme on Reducing Childhood Mortality in India

Exploring the Role of AYUSH in Complementary and Alternative Medicine in India

Suggested Readings:

1. Park, K. (2020). *Park's Textbook of Preventive and Social Medicine* (25th ed.). M/S Banarsidas Bhanot Publishers.
2. Rao, K. S., & Gopakumar, K. (2009). *Essentials of Public Health and Community Medicine*. CBS Publishers & Distributors.
3. Goel, S. L. (2009). *Social Welfare Administration in India*. Deep & Deep Publications.
4. Chaudhuri, K. P., & Singh, M. (2011). *Family Planning and Population Control in India*. PHI Learning Pvt. Ltd.
5. Health Programmemes in India by Dhar L.N.
6. Public Health in India by Monica Das Gupta and Manju Rani.
7. Health Care System and Health Policy in India by D.K. Taneja.

INTRODUCTION TO QUALITY AND PATIENT SAFETY

Subject Name	Code	Type of course	T-P-Pj	Credit
Introduction to Quality and Patient Safety	CUTM4320	Theory + Project	3-0-1	4

Course Objectives

- To understand the basic biology and life cycle of parasites in order to recognize their role in disease transmission.
- To identify pathogenic parasites in disease diagnosis and treatment, ensuring accurate clinical intervention.
- To apply appropriate techniques for processing specimens and identifying parasites in laboratory settings.
- To distinguish parasites based on their morphological characteristics for effective diagnosis and treatment planning.

Course Outcome

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Understand policy related to lab management and infection control	PO1, PO4, PO6, PO12, PSO1, PSO3
CO2	Demonstrate proper conduct of a lab technician.	PO4, PO7, PO8, PSO1
CO3	Support in patient counselling, Health literacy and patient care.	PO3, PO7, PO9, PO10, PSO1
CO4	Develop a diagnostic division adhering to clinical establishment policy.	PO2, PO5, PO6, PO12 PSO1, PSO3
CO5	Have a clear understanding of patient safety, patient harm, and minimizing them using	PO5, PO7, PO9, PO10, PSO3

Course Outline:

Module I:

Human Factor Engineering, Patient Safety, Health Literacy, Report Distribution System, Error in Reporting System, Responding to Adverse Events, Investigation of Errors/Root Cause Analysis.

Projects: Safety Precautions in Laboratory, Report Distribution, Prescription Reading.

Module II:

Medical Error, The Science of Safety, Teamwork and Communication, Leadership, Quality Control Policy, Major Developments and Evaluation in Diagnostic Division.

Projects: Fire Safety in Lab, Documentation for Lab Establishment.

Module III:

Clinical Establishment Act Policy, National Accreditation Board of Laboratories, ISO Policy for Medical Laboratory, Fire and Safety Policy for Medical Laboratory.

Projects: Fire Safety in Lab, Documentation for Lab Establishment.

Module IV:

Personal Protective Equipment in the Laboratory, AIDS and Laboratory Safety, Safety Protection in Lab for STD and Other Infectious Diseases, Biomedical Waste Management.

Projects: PPE, Biomedical Waste Management.

Module V:

Patient Care in Medical Laboratory, Patient Rights, Counseling of Patient during Phlebotomy, First Aid in Medical Laboratory Service.

Projects: Patient Counseling, First-Aid.

Suggested Readings:

1. Gurses, A. P., & Karsh, B. T. (2010). *Patient Safety: Understanding and Responding to Adverse Events*. Springer.
2. Reason, J. (2008). *Human Error* (2nd ed.). Cambridge University Press.
3. Liu, C., & Wang, Y. (2016). *Error in Health Care: A Systematic Approach*. Springer.
4. Choudhary, R. P. (2017). *Basic Emergency and First Aid in Clinical Settings*. Jaypee Brothers Medical Publishers.
5. Saxena, R. (2012). *Patient Rights and Care in Medical Laboratories*. Elsevier India.
6. Reddy, S. V., & Reddy, M. (2011). *Patient Care in Modern Medicine*. Orient BlackSwan

PARASITOLOGY

Subject Name	Code	Type of course	T-P-Pj	Credit
Parasitology	CUTM4315	Practice	3-1-0	**4**

Course Objective:

- To describe the morphology, life cycle, and pathogenesis of protozoa, metazoa, and helminths.
- To explain the laboratory diagnosis methods for identifying parasitic infections.
- To outline treatment options for diseases caused by various parasites.
- To perform laboratory techniques for specimen processing and parasite identification.

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Understand the basic biology and life cycle of parasites.	PO1, PO5, PO7, PSO1, PSO3
CO2	Identify pathogenic parasite in disease diagnosis and treatment	PO1, PO2, PO12, PSO1, PSO2
CO3	Apply appropriate techniques for processing of specimens and identification of parasites.	PO2, PO5, PO12, PSO1, PSO2
CO4	Distinguish parasites based on their morphological examination.	PO1, PO5, PO7, PSO2, PSO3
CO5	Evaluate the severity of parasitic infection based on diagnostic results.	PO5, PO7, PO10, PSO1, PSO3

Course Outline:

Module I:

Introduction to Parasitology, General Characteristics and Classification of Protozoa and Helminths. Collection, Transport, Processing, and Preservation of Samples for Routine Parasitological Investigations.

Practice: Method of Sample Collection, Transport, Processing, and Preservation for Routine Parasitological Investigations.

Module II:

Morphology, Life Cycle, and Lab Diagnosis of Giardia, 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 Hookworm and Roundworm (Ascaris lumbricoides and Ancylostoma duodenale). Most Common Symptoms of Parasitic Infections and Diagnosis and Treatment Methods.

Practice: Routine Stool Examination for Detection of Intestinal Parasites. Concentration Techniques for Demonstration of Ova (Principles and Applications). Identification of Adult Worms from Models or Slides.

Module III:

Procedures Used in Microscopic Examination of Stool from a Parasitic Infected Individual.

Practice: Routine Stool Examination for Detection of Intestinal Parasites.

Module IV:

Laboratory Diagnosis of Various Parasites: Direct Methods, Indirect Methods, and Rapid Diagnostic Tests (RDTs).

Practice: Demonstration of Rapid Diagnostic Methods Used for Parasite Identification.

Module V:

Quantitative Buffy Coat Assay (QBC), Malaria Rapid Diagnostic Test (MRDT), Leishman Stain.

Practice: Demonstration of Some Rapid Diagnostic Methods Used for Parasite Identification.

Suggested Readings:

1. Textbook of medical Parasitolog (e-book link- https://www.pdfdrive.com/textbook-of-medical-parasitology-textbookof- medical-parasitology-e128716897.html

2. Parasitology book by K.D.Chatterjee.

(e-booklink

https://sites.google.com/site/bkthrtrpazg/atahrgiwu.https://www.goodreads.com/book/show/243 66965-parasitology-protozoology-and-helminthology-with-two-hundred-fourteen

MINI PROJECT

Subject Name	Code	Type	T + P + Pj	Credits

Mini Project	CUTM1754	Project	0-0-2	2

Course Objective:

- To contribute to the advancement of knowledge in the field of microbiology by conducting original research or exploring innovative approaches
- To apply theoretical knowledge gained during the academic coursework to real-world optometry scenarios.
- To develop skills in data collection techniques, data analysis, and interpretation, which are essential for evidence-based practice i.
- To present findings and results in a clear, concise, and professional manner.

Course Outcome:

After completion of the course, the students will be able to

COs	**Statements**	**COs with POs and PSOs Mapping**
CO1	Identify health gaps specific to a community.	PO5, PO10, PO11, PSO3
CO2	Demonstrate critical thinking in solving health related issues.	PO5, PO7, PO12, PSO3
CO3	Evaluate case studies.	PO5, PO8, PO12, PSO3
CO4	Design and address a research problem.	PO6, PO8, PO12, PSO3
CO5	Understand the steps involved in data collection and questionnaire design	PO9, PO10, PO12, PSO3

Course Outline:

- 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.

PROJECT

Subject Name	Code	Type	T + P + Pj	Credits
Mini Project	CUTM4339	Project	0-0-10	10

Course Objective:

- To contribute to the advancement of knowledge in the field of microbiology by conducting original research or exploring innovative approaches
- To apply theoretical knowledge gained during the academic coursework to real-world optometry scenarios.
- To develop skills in data collection techniques, data analysis, and interpretation, which are essential for evidence-based practice
- To develop effective communication skills through oral presentations, written reports, and patient record

Course Outcome:

After completion of the course, the students will be able to

COs	Statements	COs with POs and PSOs Mapping
CO1	Identify health gaps specific to a community.	PO5, PO10, PO11, PSO3
CO2	Demonstrate critical thinking in solving health related issues.	PO5, PO7, PO12, PSO3
CO3	Evaluate case studies.	PO5, PO8, PO12, PSO3
CO4	Design and address a research problem.	PO6, PO8, PO12, PSO3
CO5	Understand the steps involved in data collection and questionnaire design	PO9, PO10, PO12, PSO3

Course Outline:

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

INTERNSHIP

Subject Name	Code	Type	T + P + Pj	Credits
Internship	CUTM4340	Project	0-0-10	10

Course Objective:

- To gain hands-on clinical experience in conducting comprehensive diagnosis of the specimen.
- To become familiar with advanced instrumentation and technology used in the field of diagnosis
- To operate specialized diagnostic tools, imaging devices, and diagnostic instruments, enhancing their skills in evaluating health and providing accurate diagnosis.
- To develop effective patient interaction and communication skills

Course Outcome:

After completion of the course, the students will be able to,

COs	Statements	COs with POs and PSOs Mapping
CO1	Select relevant scientific literature.	PO1, PO8, PO12, PSO3
CO2	Execute appropriate data collection techniques and tools.	PO9, PO10, PO12, PSO3
CO3	Analyse data with appropriate statistical techniques.	PO5, PO9, PO12, PSO3
CO4	Design a research proposal.	PO6, PO8, PO12, PSO3
CO5	Integrate theoretical concepts and practical skills gained from their coursework to design and execute a research project	PO1, PO2, PO5, PO12, PSO1, PSO3

Course Outline:

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 second year (4th 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 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
10. Internship
11. Case record
12. Lab management and ethics
13. Evaluation – Guide (internal)
. Industries guide(external)

University-project report/ Viva