

**CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT,
ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

MASTER OF SCIENCE IN APPLIED & CLINICAL MICROBIOLOGY

2021

SYLLABUS

Master of Science in Applied and Clinical Microbiology

Course structure

SEMESTER	BASKET 1	BASKET 2	BASKET 3	BASKET 4
	School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)
I	SC-1 SC-2 SC-3 SC-4	DC-1		SFS-1
II	SC-5 SC-6 SC-7	DC-2 DC-3 DC-4	AECC-I AECC-II	SFS-2
III	SC-8	DC-5 DC-6 DC-7 DC-8	AECC-III	SFS-3
IV		DC-9 DC-10		
Minimum Credits required (96 Credits)	28 Credits	50 Credits	6 Credits	12 Credits

BASKET I
School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1709	Analytical Techniques	3+1+0	4
SC-3	CUTM1710	Biological Chemistry	2+1+0	3
SC-4	CUTM1712	Clinical Hematology	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1714	Cell and Molecular Biology	2+0+1	3
SC-7	CUTM1718	Clinical Biochemistry	2+1+0	3
SC-8	CUTM1720	Histology	3+1+0	4

BASKET II
Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	
DC-1	CUTM1711	General Microbiology	3+1+0	4
DC-2	CUTM1713	Systematic Bacteriology	3+1+0	4
DC-3	CUTM1717	Applied microbiology	2+1+0	3
DC-4	CUTM1716	Medical Parasitology and Mycology	3+2+0	5
DC-5	CUTM1719	Immunology & Virology	3+2+0	5
DC-6	CUTM1722	Clinical Bacteriology	3+1+0	4
DC-7	CUTM1721	Research Methodology	2+0+1	3
DC-8	CUTM1754	Mini Project	0+0+2	2
DC-9	CUTM1755	Internship		12
DC-10	CUTM1756	Project		12

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

BASKET I
School Core Courses
SC1- CUTM1708- Human Anatomy and Physiology

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

Objective

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

Course outcome

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

Course Outline

Module-I (10 Hours)

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

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

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

Practice: Demonstration of individual bone from skeleton.

Identification of different organs and system from chart.

Module-II (13 Hours)

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

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

Practice: Demonstration the morphology of different blood cells

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

Module-III (15 Hours)

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

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

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

Practice: Demonstration of various parts of body, tissues of body, parts of digestive

system, parts of respiratory system, parts of excretory system. Identification of different organs and system from chart

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber&Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher EdwardArnold.
3. Anatomy & Physiology- by Ross and Wilson, PublisherElsevier.
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, PublisherSatya

SC2- CUTM1709- Analytical Techniques

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Techniques	CUTM1709	Theory+ Practice	3-1-0	Fundamental Science

Objective

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Chromatographic techniques
- Electrophoretic techniques
- Principle of Spectroscopy

Course outcome

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

Course Outline

Module-I

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

Bacterial Colony Counter (Principle and working).

Microtomy: Sectioning, Staining. Application.

Cytometry: Types, Flow cytometry and its applications.

Practice: Demonstration of different Microscopes with their operation.
Preparing specimens for observing under microscopes.
Demonstration of Microtome.

Module-II

Centrifugation: Principle; Preparative, Analytical, Density gradient centrifugation.

Chromatography: Principles and Applications: Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gelfiltration, Gas Chromatography, HPLC, FPLC.

Electrophoresis: Immunoelectrophoresis, Isoelectric focusing, 2-Dgel electrophoresis.

Practice: Demonstration of Centrifuge
Demonstration of Chromatography techniques
Demonstration of Electrophoresis

Module-III

Colorimeter: Principle and Instrumentation; **Spectrophotometry:** Ultraviolet, Mass spectrophotometry; Flame photometry;

Principle, Instrumentation, Specimen preparation and Application of: X-ray diffraction, NMR, EPR. Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer.

Practice: Demonstration of Semi automated Analyzer
Demonstration of Fully automated Analyzer

Suggested Readings:

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.
(e-Book link: <https://www.pdfdrive.com/principles-and-techniques-of-biochemistry-and-molecular-biology-e174866056.html>)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)
3. Willey MJ, Sherwood LM & Woolverton C J. (2013). Prescott, Harley and Klein's

Microbiology. 7thEd., McGraw Hill.

(e-Book link: <https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html>)

4. Labs for Life (e-source link: <http://labsforlife.in/InstructionalVideo.aspx>)

SC3- CUTM1710- Biological Chemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biological Chemistry	CUTM1710	Theory+ Practice+ Project	2-1-0	General chemistry & Biology

Objective

- Work to promote good health by teaching the public and other health professionals about diet and nutrition.
- To demonstrate clinical disorders, the biochemical consequences of particular disease process and the response to therapy.
- To describe the various intracellular controls that govern the rate at which the metabolic pathway functions.
- To explain the ways in which hormones work in human body and alter cellular activity by binding to intracellular receptors.

Course outcome

- Students will be able to demonstrate an understanding of fundamental biochemical principles, such as the structure/function of metabolic pathways, and the regulation of biological/biochemical processes.
- Able to apply and effectively communicate scientific reasoning and data analysis in both written and oral forums.
- Demonstrate a thorough knowledge of the intersection between the disciplines of Biology and Chemistry.
- Appreciate the way in which practitioners in the disciplines of Biology and Chemistry intersect and bring their expertise to bear in solving complex problems involving living systems.

Course Outline

Module I

Chemical aspects of Food, Nutrition and Vitamins: Energy yielding nutrients and Calorific value of carbohydrates, fats and proteins. Basal metabolic rate (BMR) and Body Mass Index (BMI). The Food Pyramid. History, Chemistry, Absorption, transport, and storage of Vitamins, Metabolic functions and Biochemical manifestations of Water soluble Vitamins-B-Complex Vitamins : Vitamin –B1,Vitamin – B2,Vitamin-B3,Vitamin –B6, Biotin, Panthothenic acid, Folic acid, Vitamin-B12.Coenzymes of B-Complex Vitamins. Fat soluble Vitamins: Vitamin -A, Vitamin - D, Vitamin-E, Vitamin- K.

Practice: Calculation of BMR and BMI.

Module II

Cellular Respiration: Aerobic and anaerobic respiration; Energy yield and regulation. Oxidation of fatty acid, Transamination and Deamination reaction, Urea formation and transport, Ketogenesis.

Practice: Solutions: Definition, use, classification, preparation and storage. Stock and working solutions. Molar and Normal solutions of compounds and acids. (NaCl, NaOH, HCl, H₂SO₄)

Module III

Biochemical aspects of Hormone: Hormone receptors and intracellular messengers, Adenylate cyclase, protein kinase and phosphodiesterase. Role of Insulin, glucagon's, epinephrine and their mechanism of action.

Practice: Diabetes and other disorder identification.

Suggested Readings:

1. Lehninger Principles of Biochemistry (<https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-e164892141.html>)
2. Fundamentals of Biochemistry: Life at the Molecular Level (<https://www.pdfdrive.com/fundamentals-of-biochemistry-life-at-the-molecular-level-e186753533.html>)

SC4- CUTM1712 - Clinical Hematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical Hematology	CUTM1712	Theory+Practice	3-1-0	Basic Medical science

Objective

- The Clinical Hematology course will cover the diagnosis and management of blood cell disorders, anatomy and physiology of hematopoiesis, routine specialized hematology tests, analysis, classification, and monitoring of blood cell abnormalities.
- Clinically relevant hematological analysis for deeper understanding evaluate normal and abnormal cell morphology with associated diseases and other blood components.
- Be able to handle an investigation of hematological disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.

Course outcome

- Differentiate various hematological procedures and the use of basic equipment essential to working in a Hematology Laboratory.
- Discuss differences between Quality control, Quality Assurance, and Continuing Quality Improvement principles as used in the Hematology Laboratory.
- Categorize various hematology analyses, operational principles of various hematology instruments, and troubleshooting of various instruments.
- Explain the principles and theories utilized in a variety of problem-solving situations.
- Define testing suitability standards for Hematology specimens.
- To be able to carry out blood sampling & Evaluate specimen acceptability.

Course Outline

Module-I (16 Hrs)

Scope & importance of Haematology, important equipment and chemicals, various test performed in Haematology laboratory. Identify and/or confirm the composition of various red blood cell inclusions. Function of normal cellular components, Formation of blood, Erythropoiesis, thrombopoiesis. Anticoagulants, definition, Uses, Different types, mode of action, their merits and demerits. Morphology of normal blood cells, abnormal morphology & diseases, Hematological Disorder

Practice: Demonstration of instruments used in hematology- Microscope, Blood Cell counter. Demonstration of different blood cell, their synthesis from slide presentation or chart. Demonstration the normal and abnormal morphology of different blood cells.

Module-II (18 Hrs)

Collection and preservation of blood: different methods of collection(venous and capillary blood), preservation, changes in stored blood normal and absolute values in hematology,Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman stain, Malaria thick smear preparation, Different types of stains, Romanowsky stains: principle of staining, Hemoglobin estimation (oxy Hb and cyanmethaemoglobinmethod), Complete Blood Cell Count: Total RBC count, Total WBC count, Platelet count, DLC value, HB, MCH, MCV, MCHC, Determination of ESR by wintrobes, Determination of ESR by Westergren's method, Determination of PCV by Wintrobes, Reticulocyte Count, Absolute Eosinophil Count, Morphology of Red Blood Cells.

Practice: Different methods of collection (venous and capillary blood), Preparation of DLC, TLC, TRBC etc. Estimation of ESR, Complete blood cell count, Blood grouping, Hb and values of MCH, MCV, MCHC, PCV, Staining & Smear preparation.

Module-III (14 Hrs)

Hematological Disorders

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

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

Practice: Observation about different normal and abnormal morphology of RBCs, WBCs, Platelet, Bleeding Time & Clotting Time, PT & APTT.

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
6. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link-
<https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDEkQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link-
<https://books.google.co.in/books?id=QQcYAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDEkQ6wEwAnoECAIQQAQ#v=onepage&q=hematology&f=false>

SC5-CUTM1715 -Clinical Pathology

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

Objective

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

Course outcome

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

Course Outline

Module-I (16 Hrs)

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

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

Lab:-

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

Module-II (14 Hrs)

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

Practice: Microscopic finding of stool, Morphology of stool parasite

Lab:-

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

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

Module-III (15 Hrs)

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

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

Lab:-

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

CSF Analysis: Collection and Routine Examination

Synovial Fluid: Collection and Routine examination

Pleural Fluid: Collection and routine examination

Pericardial Fluid: Collection and routine examination

Bacteriological Examination of throat swab

Suggested Readings:

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

SC6- CUTM1714 - Cell and Molecular Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Cell and Molecular Biology	CUTM1714	Theory+ Project	2-0-1	Fundamental Science

Objective

- Understanding the central dogma of life
- To understand the concept of gene regulation and its impact
- The use of several molecular diagnostic techniques for disease interpretation

Course outcome

- After completion of the course the student will be gain knowledge of the significance of genes and proteins.
- They will understand the mechanism of gene expression and protein synthesis,
- The significance of gene expression regulation will become clear.
- The students will understand the use of several molecular techniques in disease diagnosis.

Course Outline

Module-I

DNA structure. Salient features of double helix, Types of DNA. DNA topology - linking number, topoisomerases. Bidirectional and unidirectional replication, semi- conservative, semi- discontinuous replication.

Mechanism of DNA replication. Enzymes and proteins involved in DNA replication.

Module-II

RNA Structure. Transcription: Promoter, Polymerase and the transcription unit. **Transcription in Eukaryotes:** RNA polymerases, general Transcription factors. Split genes, concept of introns and exons, RNA splicing, spliceosome machinery, concept of alternative splicing, Polyadenylation and capping, Processing of rRNA, RNA interference: si RNA, miRNA and its significance.

Translational machinery: Charging of tRNA, aminoacyl tRNA synthetases. Mechanisms of initiation, elongation and termination of polypeptides in both prokaryotes and eukaryotes.

Malignant transformation of cells and role of oncogenes, Tumor virus, Proto- oncogenes, Tumor suppressor genes; Apoptosis, cell regeneration.

Module- III

Molecular diagnostics: Recombinant DNA Technology and its applications, Polymerase chain reaction and its application in diagnosis of pathogens, Site directed mutagenesis, DNA finger printing, DNase Foot Printing, antisense RNA technology, inherited genetic disorders in man and gene therapy.

Suggested Readings:

1. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 7th edition, Cold Spring Harbour Lab. Press, Pearson Publication.
(e-Book link: <https://www.pdfdrive.com/molecular-biology-of-the-gene-e158278674.html>)
2. Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter (2015) Molecular Biology of the cell, 6th edition, Taylor and Francis Group.
(e-Book link: <https://www.pdfdrive.com/molecular-biology-of-the-cell-d184612905.html>)
3. Principles and Practice of Medicine- by Davidson, S. S., J. MacLeod and C.R.W. Edwards, 1991
Publisher Churchill Livingstone.
(e-Book link: <https://www.pdfdrive.com/davidsons-principles-and-practice-of-medicine-d186204495.html>)
4. Sambrook J and Russell DW. (2001). Molecular Cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbour Laboratory press.
(e-Book link: <https://www.pdfdrive.com/search?q=Sambrook+J+and+Russell+DW.+%282001%29.+Molecular+Cloning%3A+A+Laboratory+Manual.+4th+Edition&pagecount=&pubyear=&searchin=&more=true>)
5. Geoffrey M. Cooper, Robert E. Hausman (2007). The Cell, A molecular approach. 4th ASM Press, Washington, D.C.
(e-Book link: <https://www.pdfdrive.com/the-cell-a-molecular-approach-e186369576.html>)
6. B. Primrose and R.M. Twyman (2006) Principles of Gene Manipulation and Genomics 7th Edition. Blackwell Publishing.
(e-Book link: <https://www.pdfdrive.com/principles-of-gene-manipulation-and-genomics-e25845509.html>)

Online Tutorial links:

1. DNA Decoded (coursera link: <https://www.coursera.org/learn/dna-decoded>)
2. DNA Replication (Lecturio link: <https://app.lecturio.com/#/course/s/8020>)
3. Transcription (Lecturio link: <https://app.lecturio.com/#/lecture/s/5990/35832>)

SC7- CUTM1718 – Clinical Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical Biochemistry	CUTM1718	Theory+Practice	2-1-0	Basic Medical science

Objective

- Understanding the concept of Biochemical analyzing instruments, chemicals and normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc

Course outcome

- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.
- To learn normal ranges and abnormal ranges of biochemical components and hormones.
- To study about diseases related to biochemical and hormone imbalance in human body.

Course Outline

Module-I (10 Hrs)

LFT, KFT, Lipid profile, Estimation of Glucose, Hormone test: T3, T4, TSH, Prolactin, 17 Kitosteroids

Practice: Demonstration the centrifuge machine, Demonstration of Colorimeter, Method of estimation and assessment for: a. Glucose tolerance test, Detection of sugar in Urine, Estimation of Protein in urine, Estimation of Liver function test, Kidney function test, Lipid profile, Thyroid

Module-II (10 Hrs)

Metabolic disorders and Diagnostic enzymology: Disorders of metabolism: carbohydrate, Lipids, Amino acids and Nucleic acids. Diagnostic enzymes: Role of Enzymes in Clinical Practice: Marker enzymes in myocardium, liver and pancreas. Tumor markers, Radio isotope techniques

Module-III (14 Hrs)

Organ function tests: Liver function tests, Bile pigment metabolism, tests for liver function. Jaundice and its type, Functions of Kidney, Urine formation and renal function tests disease of kidney, Renal Calculi: Theory of formation and analysis, Gastric Analysis, Composition of gastric juice, concepts of free and bound acid, Fractional Test Meal

Practice: Operation procedure of Centrifuge machine, colorimeter etc. Estimation of Liver function test, Kidney function test, Estimation of bile pigment, bile salt, bilirubin etc.

Suggested Readings

1. Text book of Medical Laboratory Technology by P. B. Godker, Publisher Bhalani.
2. Text book of Medical Biochemistry by Chaterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee
4. Principal of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.
6. Ebook link-
https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/medicalbiochemistry.pdf
7. Ebook link-
https://books.google.co.in/books?id=Je_pJfb2r0cC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
8. Ebook link-
https://books.google.co.in/books?id=csPcDAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
9. Ebook link-
https://books.google.co.in/books?id=2FkXAwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

SC-8- CUTM1720- Histology

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

Objective

- Understanding the concept of histotechnology; Basic concepts about routine methods of examination of tissues Collection.
- perform routine laboratory procedures encompassing all major areas of the histology laboratory.

- accurately and proficiently embed tissue and understand the principles of microtomy.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course outcome

- In this section students will be made aware of terminology used in histotechnology, various instruments and their maintenance and also learn the processing of various samples for histopathological investigations.
- Reception and labeling of histological specimens.
- Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.
- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.

Module- I (8 Hrs)

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

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

Module- II (8 Hrs)

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

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

Module- III (10 Hrs)

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

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

Module- IV (8 Hrs)

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

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

Module- V (8 Hrs)

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

Practice: Processing of tissue by manual and automated processor method. To demonstrate various part and types of microtome. To learn sharpening of microtome knife (Honing and stropping

technique) To perform section cutting, learn mounting of stained smears. To practice attachment of tissue sections to glass slides To learn using tissue floatation bath drying of sections in incubator (37⁰ C)

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, Publisher Elsevier
6. Textbook of Medical Laboratory Technology by Praful B Godkar, Publisher Bhalami
7. Ebook link-
https://books.google.co.in/books?id=qWScAQAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
8. Ebook link-
https://books.google.co.in/books?id=MrpEDwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
9. Ebook link-
https://books.google.co.in/books?id=CERPDwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

BASKET II
Discipline Core Courses
DC-1- CUTM1711- General Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
General Microbiology	CUTM1711	Theory+ Practice	3-1-0	Fundamental Science

Objective

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

Course outcome

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

Course Outline

Module-I (12 Hours)

History and scope of Microbiology, Recent trends and developments in modern microbiology. Identification, characterization and classification of microorganisms. Distinguishing characteristics between prokaryotic and eukaryotic cells. Structure and function of Cell wall of bacteria, cell membranes, flagella, pili, capsule, gas vesicles, carboxysomes, magnetosomes and phycobolisolomes.

Practice:

1. Preparation of bacterial smear and staining – Gram's, Acid-fast, Staining of bacterial spores flagella, capsule, spirochaetes
2. Demonstration of various parts of microscope its functioning and care.

Module-II (12 Hours)

Methods of sterilization: Physical methods – Dry heat, moist heat, radiation methods, filtration methods, chemical methods and their application. Concept of containment facility, sterilization at industrial level. Different staining techniques used in bacteriology.

Practice:

3. Demonstration the different type of Sterilization technique and operation of the Instruments used in microbiological lab.
4. Preparation of media, cultivation of bacteria

Module-III (16 Hours)

Bacterial nutrition – Nutritional requirement of bacteria. Cultivation of aerobes and anaerobes, Reproduction in bacteria and spore formation. Bacterial growth curve and bacterial nutrition Media. Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media).

Practice:

5. Biochemical tests for identification of bacteria
6. Preservation of stock cultures of bacteria

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology-by Fritz H. Kayser et al
3. Medical Laboratory Technology by Kanai Lal Mukherjee, Publisher Tata McGrawHill
4. Microbiology (7th Ed)- by Prescott
5. Practical Book of Medical Microbiology by Satish Gupta, Publisher JaypeeBrothers
6. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough
7. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
8. Clinical laboratory methods and diagnosis by Gradwohls, 2000, Publisher Mosby
9. Medical laboratory science theory and practice, J Ochei and Kolhatkar, 2002, publisher TBS

DC-2- CUTM1713 - Systemic Bacteriology

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

Objective

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

Course outcome

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

Course Outline

Module –I (9 Hrs)

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

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

Module -II (12 Hrs)

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

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

Module -III (18 Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of Gram- Negative Bacilli Aerobic: Enterobacteriaceae, Citrobacter spp , Edwardsiella spp ,Enterobacter spp , Escherichia coli, Ewingella , Hafnia spp., Klebsiella spp., Morganella spp., Proteus spp., Providencia spp., Salmonella spp., Serratia spp., Shigella spp., Yersinia spp., Vibrio spp., Pseudomonas spp., Chlamydia and chlamydochloa, Brucella spp., Bordetella spp., Haemophilus spp., mycoplasma spp.

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

Suggested Readings:

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

DC-3- CUTM1717 - Applied microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Applied Microbiology	CUTM1717	Theory+ Practice	2-1-0	Fundamental Science

Objective

- To impart knowledge of the basic principles of bacteriology, virology, including the nature of pathogenic microorganisms, pathogenesis, laboratory diagnosis, transmission, prevention and control of diseases common in the country

Course outcome

- To know the applications of microbiology in diagnostics, hospitals and community
- Learn principles underlying diagnostic tests and handle kits for diagnosis of disease
- Explain prognosis of disease and become aware about the role of medical microbiology in public health

Course Outline

Module-I (6 Hours)

The normal flora, collection and transport of clinical specimens, Collection and preliminary processing of specimens.

Practice: Isolation of *Streptococcus mutans* from oral cavity
Procedure for sample collection from skin, ear.

Module -II (9 Hours)

Diagnostic microbiology- an approach to laboratory diagnosis, Rapid and automation methods in diagnostic microbiology, Molecular techniques in microbiology, Serological and skin tests

Practice: Demonstration of antigen-antibody reaction
Pus culture and sensitivity

Module –III (8 Hours)

Microbiology in the service of human being, Community microbiology, Emerging and re-emerging Microbial disease, Nosocomial infections

Practice: Urine culture and sensitivity
Isolation of microorganism from spoiled fruit juice

Module -IV (6 Hours)

Hospital and laboratory waste, Diagnostic virology, Emergency microbiology Bacteriology of Milk, Air and Water

Practice: Isolation of microorganism from curd
Isolation of microorganism from Air

Suggested Readings:

1. Medical Parasitology by RL Ichhpujani and Rajesh Bhatia, jaypeepublisher
2. Short text book of medical microbiology by Satish gupt, PublisherJaypee

DC-4- CUTM1716 - Medical Parasitology and Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Parasitology and Mycology	CUTM1716	Theory+Practice	3-2-0	Fundamental Science

Objective

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites and fungi.
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites and fungi.
- Describe basic principle and procedures of isolation of fungus and parasites from clinical samples like stool, vaginal swab etc.
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites and fungi.

Course outcome

- Identification of pathogenic parasite and fungus in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

Module I

General Parasitology- Classification of medically important parasites, epidemiology of parasitic infections, immunology of human parasitic infections. Diagnostic parasitology- Systematic study of following parasites (Geographical distribution, habitat, morphology and life cycle, risk of infection, pathogenesis, laboratory diagnosis prophylaxis and serological diagnosis)

Practice: Collection & transport of specimens for examination of stool for parasites identification. Examination of other body fluids for parasites identification. Concentration techniques for demonstration of Ova (Principles and applications). Routine Stool examination for detection of intestinal parasites.

Module-II

Protozoa – Intestinal amoeba, free living pathologic amoeba, giardia, trichomonas, balantidium, isospora, cryptosporidium, microspora, cyclospora Plasmodia, leishmania, trypanasoma, toxoplasma, babesia.

Helminthes– Cestodes – Taenia, Echinococcus, Diphylobothrium, Hymenolepis, Multiceps, Trematodes- Schistosoma, Fasciola, Fasciolepis, Paragonimus, Clonorchis, Opisthorchis. Nematodes- Ascaris, Hookworm (Ancylostoma), Trichuris, Enterobius, Strongyloides, Filaria, Trichinella, Toxocara, Dracunculus Biological vectors.

Practice: Identification of adult worms from model's or slide's. Identification of different parasites their morphology from slide's. Culture techniques for parasites. Serological diagnostic methods.

Module-III

General Mycology – Fungus – Classification Fungal Structure & Morphology, Reproduction in fungi, Immunity to Fungal Infections. Culture Media in Mycology, Stains in Mycology. Normal fungal flora of human beings. Diagnostic Mycology - Epidemiology, Pathogenesis, Laboratory Diagnosis of Fungal Infections. Specimen collection, preservation, Transportation & Identification of Mycological Agent. Biochemical tests for fungal identification, Anti-fungal agents, invitro tests. Serological tests for mycotic infections. Use of laboratory animals in Mycology. Typing of fungi Preparation of fungal antigens & their standardization.

Practice: To prepare culture media used routinely in mycology. Diagnostic Methods in Mycotic Infections. Isolation and identification of fungus from clinical specimen. To perform all the staining techniques for identification of fungi.

Practice: Collection & transport of specimens Examination of stool for parasites. Examination of blood & bone marrow for parasites. Examination of other body fluids & biopsy specimens for parasites. Culture techniques for parasites. Serological diagnostic methods, skin tests.

Suggested Readings:

1. Parasitology book by K.D. Chatterjee. (e-book link- <https://www.goodreads.com/book/show/24366965-parasitology-protozoology-and-helminthology-with-two-hundred-fourteen>
2. Textbook of medical Parasitology.(e-book link- <https://www.pdfdrive.com/textbook-of-medical-parasitology-textbook-of-medical-parasitology-e128716897.html>
3. Bailey & Scott's Diagnostic Microbiology (e-book-<https://www.pdfdrive.com/bailey-scotts-diagnostic-microbiology-e187863782.html>)

DC-5- CUTM1719- Immunology & Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology and Virology	CUTM1719	Theory+ Practice	3-2-0	Fundamental Science

Objective

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

system.

- To understand the properties of virus, diagnosis of important viruses and vaccination.

Course outcome

- The student will learn the application of Immunology in disease diagnosis.
- Complement system followed by the body on encountering an Antigen.
- Immune Response produced on encounter with foreign body.
- The students will learn the role of immunity in fighting disease, along with consequence of undesirable expression of immune system such as, hypersensitivity and auto immune disease.
- They will gather knowledge regarding the properties, diagnosis of virus and vaccination against them.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module – I

Immunity: Concept of Innate and Adaptive immunity.

Immune Cells and Organs: Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT

Antigens: Characteristics, Hapten, Epitopes, Adjuvants;

Antibody: Structure & its classes.

Antigen-Antibody interaction, avidity & affinity.

Serological Reactions: Principles of Precipitation, Agglutination, Immunodiffusion, Immunoelectrophoresis, ELISA, ELISPOT, Western blotting, Immunofluorescence, Immunoelectron microscopy.

Practice: Performing Serological tests: Widal test, VDRL test, ASO test, C-Reactive Protein test, Rheumatoid factor (RF) test
Precipitation in agarose gel
Performing Ouchterlony Double diffusion test

Demonstration of SDS-PAGE

Demonstration of ELISA

Demonstration of Western blotting

Module – II

Complement System: Role of complement system in immune response, Complement components and Activation pathways.

Immune Response: Cell mediated and humoral Immunity.

Monoclonal antibodies: Production, characterization and applications.

Types of Autoimmunity and Hypersensitivity with examples; Immunodeficiencies, SCID, DiGeorge syndrome, Chediak- Higashi syndrome, Leukocyte adhesion deficiency, CGD.

Module-III

Virus: General properties, concept of viroids, virusoids, satellite viruses and Prions.

Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses.

Isolation, purification and cultivation of viruses.

Serological diagnosis of virus infections.

Arthropod borne and rodent borne virus diseases, Picorna viruses and diseases, Hepatitis viruses, Rabies and other neuro viruses, Orthomyxo and paramyxo viruses, Coronaviridae, Pox, Adeno, Herpes, Reo, Rota virus, HIV Viruses, Oncogenic viruses.

Vaccines: their Preparation and their immunization schedules.

Practice: Serological diagnosis of virus borne diseases: HBsAg, HIV

Suggested Readings:

1. Kuby's Immunology (7th Ed) - by J. Owen, J. Punt, S. Strandford. Macmillan Higher Education, England.
(e-book link: <https://www.pdfdrive.com/kuby-immunology-7th-edition-2013-e44842271.html>)
2. Roitt's Essential Immunology (13th Ed)- by Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. Wiley Blackwell.
(e-book link: [http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition\(www.myuptodate.com\).pdf](http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition(www.myuptodate.com).pdf))
3. Prescott, Harley, and Klein's Microbiology (Seventh Edition)- by Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton. McGrawHill.
4. Microbiology An Introduction (10th Edition)- by Gerard J. Tortora, Berdell R. Funke, Christine

- L. Case. Pearson.
5. Text book of Microbiology (7th Edition)- by Ananthanereyan & Paniker, Publisher Universities press.
(e-book link: <https://www.pdfdrive.com/textbook-of-microbiology-e177143667.html>)
 6. Fundamentals of Molecular Virology (2nd Edition)- by Nicholas H. Acheson, Wiley Publishers.
(e-Book link: <https://www.pdfdrive.com/fundamentals-of-molecular-virology-d157673335.html>)
 7. Principles of Virology (4th Edition)- by Jane Flint, Glenn F. Rall, Vincent R. Racaniello, Anna Marie Skalka, Lynn W. Enquist. ASM Press, Washington, DC.
(e-Book link: <https://www.pdfdrive.com/principles-of-virology-d158020773.html>)
 8. Virology: Principles and Applications- by John B. Carter and Venetia A. Saunders. Wiley Publishers.
(e-Book link: <https://rgmaisayah.files.wordpress.com/2013/12/virology-principles-and-applications.pdf>)
 9. Practical Immunology (4th Edition)- by Frank C. Hay, Olwyn M.R. Westwood. Blackwell Science.
(e-Book link: <https://www.pdfdrive.com/practical-immunology-d34330313.html>)

Online Tutorial links:

1. Fundamentals of Immunology: Innate Immunity and B-Cell Function
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalsimmunitybcells>)
2. Fundamentals of Immunology: T Cells and Signaling
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalstcellssignaling>)
3. Fundamentals of Immunology: Death by Friendly Fire
(Coursera link: <https://www.coursera.org/learn/immunology-friendlyfire>)
4. Viruses & How to Beat Them: Cells, Immunity, Vaccines
(edX link: <https://www.edx.org/course/viruses-how-to-beat-them-cells-immunity-vaccines>)
5. The Immune System: New Developments in Research
(edX link: <https://www.edx.org/course/the-immune-system-new-developments-in-research-par>)

DC-6- CUTM1722- Clinical Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical Bacteriology	CUTM1722	Theory+ Practice	3-1-0	Fundamental Science

Objective

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

Course outcome

- To learn the diagnosis of bacteria from infective regions of the body
- Study of their sensitivity
- Examination of bacteria from common samples.
- Study of control measures for nosocomial infection.
- Student can safeguard himself & society and can work diagnostics and hospitals

Course Outline

Module-I (12 Hours)

Laboratory strategy in the diagnosis of various Infective syndromes: Samples of choice, Collection, transportation and processing of samples for laboratory diagnosis of the following complications: a) Septicemia and bacteraemia b) Upper Respiratory tract infections, c) Lower Respiratory tract infections d) Wound, skin, and deep sepsis, e) Urinary tract infections, f) Genital Tract infections, g) Meningitis, h) Gastro intestinal infections, i) Enteric fever, j) Tuberculosis (Pulmonary and Extra- pulmonary), k) Pyrexia of unknown origin

Practice: Collection of nasal swab and its culture

Isolation of microorganism from wound

Module-II (6 Hours)

Antibiotic susceptibility testing in bacteriology- a. Definition of antibiotics, b. Culture medium used for Antibiotic susceptibility testing, c. Preparation and standardization of inoculum, d. Control bacterial strains, e. Choice of antibiotics, f. MIC and MBC, g. Various methods of Antibiotic susceptibility testing with special reference to Stokes method and Kirby-Bauer method, h. Tests for production of β -lactamase

Practice: Preparation and use of different media in bacteriology laboratory

Antimicrobial susceptibility testing

Module-3 (10 Hours)

Bacteriological examination of water, milk, food and air –

a. Examination of water - Collection and transportation of water sample, Presumptive coliform count, Eijkman test, Introduction and importance of other bacteria considered as indicators of faecal contamination

b. Examination of Milk and milk products - Basic Concepts regarding gradation of milk, Various tests for Bacteriological examination

c. Examination of food articles -Basic Concepts regarding classification of food like frozen food,

canned food, raw food, cooked food etc. Various tests for Bacteriological examination with special reference to food poisoning bacteria

d. Examination of Air -Significance of air bacteriology in healthcare facilities, Collection processing and reporting of an air sample.

Practice: Isolation of microorganisms from frozen food

Isolation of microorganisms from water

Suggested Readings:

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanereyan
3. Medical Microbiology by Paniker & SatishGupte
4. Medical Microbiology-by Fritz H. Kayser et al
5. Bailey and Scott's Diagnostic Microbiology(12th) Ed
6. Medical laboratory Technology vol. I, II, III by Mukherjee
7. Medical Laboratory manual for tropical countries Vol II Microbiology by MoniaCheesbrough

DC-7- CUTM1721- Research Methodology

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

Objective

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

Course outcome

- Students can understand the ethical and philosophical issues associated with research in education

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

Course Outline

Module- I (9 Hrs)

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

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

Module- II (8 Hrs)

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

Module- III (14 Hrs)

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

Project: Writing a review on Nosocomial urinary tract infection.

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

Writing a review on Virus culture

Literature survey on Covid-19

Suggested Readings:

1. Research Methodology by C.R. Kothari (3rd Ed)
2. Research Methodology In the Medical & Biological Sciences by Petter Laake et al.
3. Essentials of Research Design and Methodology by Geoffrey Marczyk et al.
4. WHO, Health Research Methodology: A guide for training in research Methods, 2ndEdition, 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 HealthResearch Council.
7. Field Trials of Health Interventions in Developing Countries by Smith PG, Morrow.

DC-8- CUTM1754- Mini Project

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

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

Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/ survey.

DC-9- CUTM1755 – Internship

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

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of

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

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

Proposal Development:

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

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have following format:

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

Internship

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

DC-10- CUTM1756 - Project

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

Project work:

Suggested Project title

1. Antibacterial activity of sweet orange (citrus sinensis) on Staphylococcus aureus and Escherichia coli isolated from wound infected.
2. The incidence of Salmonella and Escherichia 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