



Bachelor of Medical Laboratory Technology (BMLT)

EFFECTIVE FROM

ACADEMIC SESSION: 2025 – 2028

SYLLABUS

DEPARTMENT OF ALLIED HEALTH
(सहबद्ध स्वास्थ्य विभाग)

Faculty of Health Sciences, Jharkhand Rai University, Ranchi

Semester-III

Program: - BMLT
Semester: - III
Course: - Introduction to Microbiology
Course Code: - 42ABMT018

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Recall the history, scope, branches of microbiology, and contributions of the Bhartiya Knowledge System (BKS) in the development of microbiology.

CO2: Explain the classification of microorganisms.

CO3: Identify the causative organisms and laboratory diagnostic methods of common bacterial.

CO4: Differentiate various bacterial and fungal pathogens based on morphology, cultural characteristics.

CO5: Design an appropriate laboratory workflow for the isolation, identification.

Course Content: Introduction to Microbiology

Topics	Hours
Unit: -I Introduction to Microbiology	9
History, role of microbiology in health and diseases. History of microbiology in the Bhartiya Knowledge System (BKS) Different branches of Microbiology. Classification of microorganisms, Autotrophic and heterotrophic organisms. Difference between Eukaryotic and prokaryotic cells. Different types of bacteria including cyanobacteria, Gram positive and Gram-Negative bacteria, Archaeobacterial, Actinomycetes and Rickettsia.	
Unit: - II Growth, Control and Identification of Micro- organisms	
Culture media and its different types. Principles of different types of staining, including gram staining and acid- fast staining. Anaerobic cultivation, isolation and inoculation, separation of pure cultures from mixed cultures. Principles and methods of sterilization, Physical, Chemical and Mechanical methods of sterilization. Uses and mode of action of various disinfectants and antiseptics.	
Unit: - III: Structure & physiology of bacterial cell	
Bergey's system and various classifications of bacteria. Bacterial cell structure including cell wall, plasma membrane, capsule, flagella, fimbriae, Pilli, endospores, mesosome, ribosome. Genetic material: Nucleoid, plasmid, and transposable elements. Nutrition in bacteria, methods of uptake of nutrients by the cell, Active & Passive methods. Growth factors, factors affecting growth, growth curve, and mathematics of growth.	9
Unit: -IV: Human pathogenic bacteria and lab diagnosis	9
Introduction to disease, Epidemic, Endemic, Pandemic. Bacterial infections caused by Mycobacterium like Tuberculosis, Leprosy. Air transmitted bacterial diseases: Diphtheria, Whooping cough. Intestinal infections: Enteric fever, cholera. Urinary tract infections.	
Unit: -V: Human pathogenic fungi and lab diagnosis	9
Introduction to Fungi: structure of fungal cell. Symbiotic relationship and various fungal classes. Fungal infections including superficial dermatophyte fungal infections. Candidiasis, Nosocomial infections. Pulmonary infections, Eye and ear fungal infections.	

Suggested Reading:

1. Prescott's Microbiology Willey, Sandman and Wood, McGraw Hill
2. Microbiology Purohit, Agrobios India
3. A Textbook of Microbiology Dubey & Maheshwari, S. Chand
4. Microbiology Pelczar, Chan & Kreig, McGraw Hill, 5th edition

Program: - BMLT

Semester: - III
Course: - Haematology - II
Course Code: - 42ABMT019

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Explain the calculation and clinical significance of red cell indices, eosinophil count, and reticulocyte count.

CO2: Describe bone marrow collection methods, smear preparation, and laboratory findings of sickle cell disease.

CO3: Perform routine haematological procedures including blood collection, cell counts, and peripheral smear preparation.

CO4: Differentiate various abnormal RBC morphologies and correlate them with hematological disorders.

CO5: Evaluate coagulation test results and bone marrow findings to identify bleeding and hematological disorders.

Course Content: Haematology - II

Topics	Hours
Unit – I: Blood Collection and Abnormal Red blood cells	9
Introduction to Blood Collection Methods of whole blood collection, collection process and procedure Study of morphology of different variations of Abnormal RBCs	
Unit – II: Red Cell Indices, Eosinophil and Reticulocyte count	9
Calculation of different red cell indices – MCV, MCH & MCHC Various method of estimation of Eosinophil Count and its significance Estimation of Reticulocyte count	
Unit – III: Bone Marrow and Sickel Cell	9
Introduction to Bone Marrow and Sickel Cell Laboratory findings and estimation of Sickel cell preparation Various method involves in collection of Bone Marrow Preparation of Bone Marrow smear and clinical significance	
Unit – IV: Blood Coagulation and Haemorrhagic disorder	9
Blood Coagulation, Blood Coagulation Factors Mechanism of Blood Coagulation Haemorrhagic disorder- Bleeding time, Clotting time, Prothrombin time, clot retraction, Purpura	
Unit – V: Anaemia, Leukaemia, Haemophilia and Polycythaemia	9
Physiological variation of Haemophilia and Polycythaemia Causes and classification of Anaemia Causes and classification of Leukaemia	

Suggested Reading:

1. Haematology for Medical Technologists, Charles F. Seiverd, Fifth Edition. Lea & Febiger, Philadelphia
2. An introduction to Medical Laboratory Technology, Baker et al., Seventh Edition, A Hodder Arnold Publication.
3. Technical Haematology, Arthur Simmons, Third Edition, Lippincott Company.
4. Pathology Practical Book, Harsh Mohan, Fifth revised edition, Jaypee Brothers

Program: - BMLT

Semester: - III

Course: - Clinical Biochemistry-II

Course Code: - 42ABMT020

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Define diabetes, its types, and the principles of diabetic profile tests.

CO2: Explain the principles and clinical significance of Liver Function Tests

CO3: Perform and interpret common Cardiac Function Tests (CFT).

CO4: Compare the diagnostic significance of different biochemical profile tests in disease diagnosis.

CO5: Design an appropriate biochemical investigation panel based on clinical case requirements.

Course Content: Clinical Biochemistry-II

Topics	Hours
Unit – I: Diabetes and Diabetic Profile Test	9
Introduction to Diabetes, Type of Diabetes, diagnosis of Diabetes Different method involves to diagnose diabetes and their clinical significance Glucose Tolerance Test with graphical presentation	
Unit – II: Liver Function Test	9
Introduction to Liver, types of tests involve Various method involves in different types of tests in LFT Clinical significance in different types of tests	
Unit – III: Kidney Function Test	9
Introduction to Kidney, types of tests involve Various method involves in different types of tests in KFT Clinical significance in different types of tests	
Unit – IV: Cardiac Function Test	9
Introduction to Heart, types of tests involve Various method involves in different types of tests in CFT Clinical significance in different types of tests	
Unit – V: Electrolytes and Enzymatic Assay Test	9
Illustrate different type of Electrolytes and Enzymes Method involves to diagnose the level of electrolytes and enzymes Study the clinical significance in diagnosis the level of electrolytes and enzymes	

Suggested Reading:

1. Clinical Biochemistry, Nanda Maheshwari, Jaypee Brothers
2. Textbook of Clinical Biochemistry, Ramnik Sood, CBS Publisher
3. Practical Clinical Biochemistry, Ranjana Chawla, Jaypee Brothers

Program: - BMLT

Semester: - III

Course: - Environmental Science

Course Code: - 42ABMT021

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Define the basic concepts, scope, and importance of environmental science and ecology.

CO2: Describe the structure and functions of ecosystems, food chains, food webs, and ecological pyramids.

CO3: Explain the different segments of the environment and their characteristics.

CO4: Analyze the impact of environmental pollution on ecosystems and public health.

CO5: Propose practical solutions for environmental conservation and pollution control in healthcare and community settings.

Course Content: Environmental Science

Topics	Hours
Unit-I: Multidisciplinary nature of environmental Science and Ecology	9
Definition, scope, importance and need for public awareness. Ecosystem, basic structure of an ecosystem (abiotic and biotic components), Biogeochemical cycles (carbon cycle, oxygen cycle, nitrogen cycle and hydrological cycle) Food chain, food web, Ecological pyramid	
Unit -II: Segments of environment	
Atmosphere, Structure of atmosphere Lithosphere, soil profile and composition of soil Hydrosphere, Biosphere	
Unit -III: Water Pollution and waste water treatment	
Water resources, Sources of water pollution, various pollutants, their toxic effect Potability of water (Indian standard of drinking water) primary and secondary waste water treatment Trickling filter & Activated sludge process	9
Unit -IV Air Pollution	9
Introduction, classification of air pollutants, Toxic effects of air pollutants, sources and their control measure ESP, catalytic converter, and bag house filter, Greenhouse effect, Global warming, Ozone depletion.	
Unit -V A brief introduction to Noise Pollution, Soil Pollution, and radiation pollution	9
Noise Pollution (Introduction & sources) Effects and control measures of noise pollution Soil Pollution (Introduction & sources) Effects and control measures of soil pollution, Radiation pollution	

Suggested Reading:

1. Environmental chemistry, A. K. Dey
2. A basic course in Environmental studies, Deswal & Deswal
3. Environmental pollution and control, C. S. Rao

Program: - BMLT

Semester: - III

Course: - Microbiology Lab.

Course Code: - 42ABMT022

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the principles and uses of inoculation, incubation, and sterilization instruments.

CO2: Demonstrate pure culture techniques using streak, spread, and pour plate methods.

CO3: Explain the methods of microbial control using moist heat, dry heat, and UV radiation.

CO4: Differentiate suitable culture methods for obtaining pure bacterial cultures.

CO5: Interpret Gram staining results to classify bacteria as Gram-positive or Gram-negative.

Course Content: Microbiology Lab.

Topics	Hours
Unit – I: Introduction to Microbiology	6
1. Introduction to the use of laboratory instruments and safety precautions. A) Instruments for Inoculation and Incubation B) Instruments for Sterilization	
Unit – II: Media preparation for Micro-organisms	
1. To prepare basic liquid media (broth) for routine cultivation of bacteria. 2. Preparation of basic solid media, Agar slants and Agar deep tubes for routine cultivation of microorganism.	6
Unit – III: Growth of Micro- organisms	6
1. To obtain pure culture of bacteria by streak plate method. 2. To obtain pure culture of bacteria by spread plate method. 3. To obtain pure culture of bacteria by pour plate method.	
Unit – IV: Control of Micro-organisms	
1. Physical agents of control by moist heat and dry heat. 2. Mechanical agents of control UV radiation.	6
Unit – V: Identification of Bacteria	6
1. Preparation of bacterial smears. 2. To perform gram staining of bacteria.	

Suggested Reading:

1. Experiments in microbiology, Plant pathology and Biotechnology” K. R. Aneja, New age publication
2. Mackie and McCartney “Practical medical microbiology” Collee, Fraser, Marmion, Simmons, Elsevier publication
3. Practical Microbiology Dubey & Maheshwari, S. Chand
4. Laboratory manual in microbiology P. Gunasekaran, Newage international publishers

Program: - BMLT

Semester: - III

Course: - Haematology Lab.- II

Course Code: - 42ABMT023

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the principles and methods of blood collection and blood smear preparation.

CO2: Explain the standardization of laboratory instruments, glassware, and identification of abnormal red cell morphology.

CO3: Prepare and demonstrate sickle cell smear and bone marrow smear using standard laboratory techniques.

CO4: Analyze peripheral blood and bone marrow smears to differentiate normal and abnormal haematological findings.

CO5: Interpret red cell indices and haematological parameters for the diagnosis of blood disorders.

Course Content: Haematology Lab.- II

Topics	Hours
Unit – I: Concept of Blood collection and slide preparation	6
Determination of various method of Blood collection Preparation of whole blood smear. Standardization of instruments and glassware for adaptation for Sample collection. Experiment based on study of morphology of abnormal red cell and their identification.	
Unit – II: Estimation of Eosinophil and Reticulocyte Count	
Determination of MCH, MCV and MCHC Calculation of Red Cell Indices by Hb, PCV and Red cell count Estimation of Absolute Eosinophil Count Estimation of Reticulocyte Count	6
Unit – III: Preparation of Sickel Cell and Bone marrow smear	6
Determination of Sickel cell smear Determination of Bone marrow smear Preparation of sickle cell smear	
Unit – IV: Haemorrhagic disorder and Blood coagulation	6
Determination of bleeding time by various methods Determination of clotting time by various methods	
Unit – V: Diagnosis of Anaemia and Leukaemia	6
Identification of various types of Anaemia Identification of various types of Leukaemia	

Suggested Reading:

1. Haematology for Medical Technologists, Charles F. Seiverd, Fifth Edition. Lea & Febiger, Philadelphia
2. An introduction to Medical Laboratory Technology, Baker et al., Seventh Edition, A Hodder Arnold Publication.
3. Technical Haematology, Arthur Simmons, Third Edition, Lippincott Company.
4. Pathology Practical Book, Harsh Mohan, Fifth revised edition, Jaypee Brothers

Program: - BMLT

Semester: - III

Course: - Clinical Biochemistry Lab. - II

Course Code: - 42ABMT024

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the principles and procedures of diabetic profile tests, including Folin-Wu, GOD-POD, and Glucose Tolerance Test (GTT).

CO2: Perform liver function tests such as serum bilirubin, SGPT, SGOT, serum protein, and alkaline phosphatase estimation.

CO3: Determine cardiac profile parameters such as total cholesterol, HDL, triglycerides, LDL, and VLDL.

CO4: Interpret the results of diabetic, liver, kidney, cardiac, and electrolyte profile tests for clinical significance.

CO5: Analyze abnormal biochemical test results to correlate them with common disease conditions.

Course Content: Clinical Biochemistry Lab. - II

Topics	Hours
Unit – I: Diabetic Profile Test	6
Determination of Blood glucose Test by Folin-Wu method	
Determination of Blood glucose Test by GOD – POD method	
Glucose Tolerance Test (GTT)	
Unit – II: Liver Function Test	6
Determination of Serum Bilirubin Test	
Principal and procedure of SGPT test	
Principal and procedure of SGOT test	
Principal and procedure of Serum protein test	
Principal and procedure of Alkaline phosphatase test	
Unit – III: Kidney Function Test	6
Determination of Serum Urea Test	
Determination of Uric Acid Test	
Determination of Serum Creatinine Test	
Unit – IV: Cardiac Function Test	6
Determination of Serum total cholesterol	
Determination of Serum HDL Cholesterol	
Determination of Serum triglyceride test	
Determination of LDL and VLDL	
Unit – V: Electrolytes and Enzymatic Assay Test	6
Determination of Serum Sodium, Serum Potassium, Serum Chloride	
Determination of Serum Phosphorus, Serum Calcium	
Determination of Serum Amylase, Serum Lipase and LDH Test	

Suggested Reading:

1. Clinical Biochemistry, Nanda Maheshwari, Jaypee Brothers
2. Textbook of Clinical Biochemistry, Ramnik Sood, CBS Publisher
3. Practical Clinical Biochemistry, Ranjana Chawla, Jaypee Brothers

Program: - BMLT

Semester: - III

Course: - Professional Skills-II

Course Code: - 42ABMT025

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: - Demonstrate effective communication skills in academic and professional settings.

CO2: - Participate effectively in Group Discussions (GD) and debates with logical reasoning and clarity.

CO3: - Develop skills in empathy and active listening for better interpersonal relationships.

CO4: - Utilize prioritization techniques and manage tasks efficiently under deadlines.

CO5: - Analyze different leadership traits and leadership styles/types.

CO6: - Demonstrate professional behaviour including email and meeting etiquette, dress code, and professional conduct.

Course Content: Professional Skills-II

Topics	Hours
Unit-I	5
Communication Skills, Activity, Types of communication skills Public Speaking, Writing	
Unit-II	5
Art of presentation, GD and debates, Conflict resolution, Empathy and active listening	
Unit-III	5
Prioritization techniques, Dealing with deadlines, Work life balance, Stress reduction techniques	
Unit-IV	5
Teamwork and leadership, leadership traits and types, decision making in teams, emotional intelligence in workplace	
Unit-V	5
Email meeting etiquette, dress code, professional conduct, ethics in digital age	
Unit-VI	5
CV writing interview, HR techniques	

Suggested Reading:

1. "Communication Skills" – Sanjay Kumar & Pushp Lata

Program: - BMLT

Semester: - III

Course: - Laboratory Instrument

Course Code: - 42ABMT026

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Explain the principles, functions, safety measures, and maintenance of laboratory instruments.

CO2: Apply the principles of analytical instruments for laboratory testing and calibration.

CO3: Identify the working principles and applications of hematology, immunology, and biochemistry laboratory instruments.

CO4: Analyze the selection and performance of laboratory instruments for different diagnostic procedures.

CO5: Evaluate instrument accuracy, calibration, and quality control practices to ensure reliable laboratory results.

Course Content: Laboratory Instrument

Topics	Hours
Unit I: Introduction to Laboratory Instrumentation	9
Importance of laboratory instruments	
Principles of measurement and instrumentation	
Laboratory safety and quality control	
Calibration and maintenance of instruments	
Laboratory glassware and equipment care	
Unit II: Basic Laboratory Instruments	9
Laboratory balance, Centrifuge, Water bath, Hot air oven	
Incubator, Autoclave, Refrigerator and deep freezer, Distillation and deionization units	
Unit III: Analytical Instruments	9
Colorimeter: principle and applications	
Spectrophotometer (UV-Visible), Spectrofluorometer, pH meter and calibration	
Flame photometer, Electrolyte analyser	
Unit IV: Haematology and Clinical Laboratory Instruments	9
haemocytometer, Automated cell counter, ESR apparatus	
Coagulation analyser, Blood gas analyser, Glucometer	
Unit V: Immunology and Biochemistry Instruments	9
ELISA reader and washer, Semi-auto analyser	
Fully automated biochemistry analyser, Immunoassay analysers	
Quality control in clinical laboratories	

Suggested Reading:

1. **R. S. Khandpur** – *Handbook of Biomedical Instrumentation*
2. **J.J. Karr & J.M. Brown** – *Introduction to Biomedical Technology*
3. **L. Cromwell** – *Biomedical Instrumentation and Measurements*
4. **K. Ramakrishna** – *Practical Manual of Laboratory Techniques*

Semester-IV

Program: - BMLT

Semester: - IV

Course: - General Bacteriology

Course Code: - 42ABMT027

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Recall the classification, morphology, and characteristics of medically important bacteria, including Gram-positive, Gram-negative, anaerobic bacteria, and fungi.

CO2: Explain the pathogenicity, and laboratory diagnosis of clinically significant bacterial pathogens.

CO3: Apply microbiological principles to identify common bacterial pathogens.

CO4: Differentiate bacterial pathogens based on morphology, biochemical characteristics, clinical manifestations, and laboratory diagnostic methods.

CO5: Develop appropriate infection prevention and control strategies to minimize healthcare-associated infections and ensure laboratory biosafety.

Course Content: General Bacteriology

Topics	Hours
Unit-I Gram-positive bacteria & Mycobacteria	9
Gram-positive bacteria: Staphylococcus species, Streptococcus species, Corynebacterium diphtheriae, Bacillus species	
Mycobacteria: Classification and morphology	
Unit-II Anaerobes & Spore-forming anaerobes	9
Anaerobes: Non-spore-forming anaerobes. Classify anaerobes, infections caused, and laboratory diagnosis of non-sporing anaerobes	
Spore-forming anaerobes: Classify Clostridia species: Clostridium perfringens, Clostridium tetani, Clostridium botulinum, Clostridium difficile	
Unit-III Gram Negative Cocci & Enterobacteriaceae	9
Gram Negative Cocci: Neisseria meningitidis, Neisseria gonorrhoeae	
Enterobacteriaceae: Escherichia coli, Klebsiella species, Proteus species, Salmonella species, Shigella species	
Unit-IV Vibrio species & Spirochetes	9
Vibrio species, Pseudomonas and Burkholderia. Spirochetes: Classification of Spirochetes - Treponema pallidum, Leptospira, Borrelia	
Mycoplasma, Actinomycetes and Nocardia, Candida	
Unit-V Nosocomial Infection & diagnosis	9
Types of infections & diagnosis - Skin and soft tissue infections, Respiratory tract infections, Cardiovascular System & Central Nervous System infections, Otitis media, Gastrointestinal tract infections, Urinary tract infections, Genital tract Infections	
Nosocomial Infection - Hospital Acquired Infections (HAI), risk factors, sources and route. Investigation, prevention and control of hospital-acquired infections. Bacteriology of air, food, water and milk	

Suggested Reading:

1. R. Ananthanarayan & C.K. Jayaram Paniker – *Textbook of Microbiology*, Universities Press
2. C.P. Baveja – *Textbook of Microbiology*, Arya Publications
3. Subhash Chandra Parija – *Textbook of Microbiology and Immunology*, Elsevier
4. Dubey R.C. – *A Textbook of Microbiology*, S. Chand Publishers

Program: - BMLT

Semester: - IV

Course: - Clinical Pathology

Course Code: - 42ABMT028

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the formation, composition, collection, and preservation of urine, stool, and body fluid specimens.

CO2: Explain the principles and procedures of physical, chemical, and microscopic examination of urine, stool, semen, sputum, and body fluids.

CO3: Identify normal physical, chemical, and microscopic characteristics of urine, stool, semen, sputum, and body fluids.

CO4: Analyze laboratory findings of urine, stool, semen, sputum, and body fluid examinations to distinguish between normal and abnormal results.

CO5: Prepare and present accurate laboratory reports with appropriate interpretation to support clinical diagnosis and patient management.

Course Content: Clinical Pathology

Topics	Hours
Unit: I Urine analysis	8
Urine analysis: Formation and Normal Composition of urine, Indication of urine analysis, collection of urine, preservatives used for urine sample. • Physical examination of urine and interpret the result - Volume, colour, odour, specific gravity, pH, turbidity • Chemical examination of urine and interpret the result for - Glucose - Protein - Blood - Ketones	
Unit: II Faecal analysis	6
Faecal analysis: Formation and Normal composition of stool, specimen collection, scotch tape preparation, Preservatives of stool specimen, Physical, chemical and microscopic faecal analysis Physical examination-Volume, colour, consistency, odour, Blood, Mucus and Adult parasites	
Unit: III Semen analysis	5
Semen analysis: Formation of semen, method of collection, importance and method of semen analysis - Normal and abnormal morphology of sperms	
Unit: IV Body fluids	8
Body fluids: Different body fluids and methods of aspiration, characteristics of normal and abnormal body fluids, physical, chemical, and microscopic analysis of body fluids, procedure of cell count, clinical conditions - CSF, peritoneal, pericardial, pleural and synovial fluid	
Unit: V Sputum Analysis	3
Sputum Analysis: Formation of Sputum, Collection of Sputum, Analysis of Sputum	

Suggested Reading:

1. Godkar, P. B., & Godkar, D. P. (2006). *Textbook of medical laboratory technology*. Bhalani publishing house.
2. Sood, R. (2006). *Textbook of medical laboratory technology*. Jaypee Brothers Publishers.
3. Mundt, L., & Shanahan, K. (2020). *Graff's textbook of urinalysis and body fluids*. Jones & Bartlett Learning.

Program: - BMLT

Semester: - IV

Course: - Histopathology

Course Code: - 42ABMT029

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the basic principles of histopathology, laboratory organization, specimen handling, fixation, and safety practices.

CO2: Explain the steps involved in tissue processing, including grossing, dehydration, embedding, decalcification, and automated processing.

CO3: Perform routine H&E staining and explain the principles and applications of special staining techniques.

CO4: Analyze stained tissue sections to identify normal tissue architecture and different tissue types.

CO5: Evaluate histopathological findings for basic disease diagnosis using routine and special staining methods.

Course Content: Histopathology

Topics	Hours
Unit: I Introduction to Histopathology	6
Definition and scope of Histopathology, Organization of Histopathology laboratory Safety measures and laboratory ethics, Collection, labelling, transportation, and preservation of specimens, Types of biopsy and autopsy specimens, Fixatives and fixation principles.	
Unit: II Tissue Processing Techniques	6
Gross examination (Grossing), Dehydration, Clearing, Impregnation/Infiltration Embedding techniques, Decalcification of bone and teeth specimens Manual and automated tissue processing	
Unit: III Microtomy and Microscopy	6
Principles of section cutting, Types of microtomes, Care and maintenance of microtome Preparation of tissue sections, Light microscope and electron microscope Cryostat and frozen section techniques	
Unit: IV Staining Techniques	6
Theory of staining, Haematoxylin and Eosin (H&E) staining Progressive and regressive staining Special stains: PAS stain, Reticulin stain, Van Gieson stain	
Unit: V Histopathological Interpretation	6
Normal tissue architecture Identification of epithelial, connective, muscular, and nervous tissues Interpretation of stained sections Introduction to Immunohistochemistry (IHC) Applications of Histopathology in disease diagnosis	

Suggested Reading:

1. Histopathology Techniques and Its Management – Ramadas Nayak
2. Techniques in Histopathology – J. Madan
3. Basic and Advanced Laboratory Techniques in Histopathology and Cytology – Pranab Dey

Program: - BMLT

Semester: - IV

Course: - Medical Immunology

Course Code: - 42ABMT030

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the concepts of immunity, immune system, immune cells, and lymphoid organs.

CO2: Explain the types of antigens, antibodies, and the principles of antigenicity and specificity.

CO3: Discuss the principles and applications of antigen–antibody reactions and immunological techniques such as ELISA, RIA, flow cytometry, blotting, and complement fixation test.

CO4: Apply immunological principles to interpret antigen–antibody reactions and laboratory diagnostic tests.

CO5: Analyze complement pathways, immune responses, and hypersensitivity reactions in relation to disease conditions.

Course Content: Medical Immunology

Topics	Hours
Unit: I Introduction to Immunity and their types	9
Introduction to immunity and immune system	
Comprehensive introduction to Immunity and the Immune System in IKS	
Illustrate the types of Immunity, immune cells Study the measurement of Immunity, Organ related to immune system	
Unit: II Antigen and Antibodies	9
Introduction to Antigen and Antibodies Types of Antigen and Antibodies, Monoclonal antibody, Polyclonal Illustration of determines Antigenicity and specificity of Antigen, Hybridoma technology	
Unit: III Antigen Antibody Reaction	9
Introduction and General features of Antigen Antibody reaction Measure of Antigen and Antibody Types of Antigen Antibody reactions, ELISA, RIA, Flowcytometry, blotting techniques. Complement fixation test	
Unit: IV Complement, Structure and function of Immune system	9
Definition, Complement functions, MHC Class and its types, Interleukins and Interferon and its types B-cell activation and T-cell activation Classical and Alternative Pathway Biological effects of Complement Deficiencies of the complement system	
Unit: V Hypersensitivity	9
Definition and introduction to Sensitization and Allergy, Autoimmunity Classification of Hypersensitivity Schwartzman Reaction	

Suggested Reading:

1. An introduction to Medical Laboratory Technology, Baker et al., Seventh Edition, A Hodder, Arnold Publication
2. Microbiology Theory for MLT, Namita Jaggi, Jaypee

Program: - BMLT

Semester: - IV

Course: - Molecular Techniques

Course Code: - 42ABMT031

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the fundamental concepts of molecular biology, including DNA, RNA, gene expression, and the central dogma.

CO2: Explain the principles of nucleic acid extraction, quantification, and sample preservation techniques.

CO3: Demonstrate the principles and workflow of PCR and its different types used in molecular diagnostics.

CO4: Differentiate various molecular diagnostic techniques based on their principles, applications, and limitations.

CO5: Assess the role of molecular techniques in the diagnosis of infectious and genetic diseases while maintaining laboratory quality and biosafety.

Course Content: Molecular Techniques

Topics	Hours
Unit I: Introduction to Molecular Biology	6
Central Dogma of Molecular Biology, Structure and functions of DNA and RNA Gene expression and protein synthesis, Applications of molecular biology in clinical diagnostics, Biosafety and quality assurance in molecular laboratories	
Unit II: Nucleic Acid Extraction and Quantification	6
Principles of DNA and RNA extraction, Sample collection and preservation Organic and column-based extraction methods, Quantification of nucleic acids Spectrophotometry and fluorometry	
Unit III: Polymerase Chain Reaction (PCR)	6
Principle and components of PCR, Thermal cycler and PCR workflow, Conventional PCR, Reverse Transcriptase PCR (RT-PCR), Real-Time PCR (qPCR)	
Unit IV: Electrophoresis and Blotting Techniques	6
Agarose gel electrophoresis, Polyacrylamide gel electrophoresis Southern blotting, Northern blotting, Western blotting	
Unit V: Molecular Diagnostic Applications	6
Molecular diagnosis of infectious diseases, Genetic testing and mutation analysis DNA sequencing (Introduction), Microarray technology (Introduction)	

Suggested Reading:

1. Molecular Biology of the Gene – Watson et al.
2. Molecular Cloning: A Laboratory Manual – Sambrook & Russell.
3. Gene Cloning and DNA Analysis – T.A. Brown.
4. Principles and Techniques of Biochemistry and Molecular Biology – Wilson & Walker.

Program: - BMLT

Semester: - IV

Course: - General Bacteriology Lab.

Course Code: - 42ABMT032

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the morphology, cultural characteristics, and laboratory identification of common bacterial pathogens.

CO2: Perform culture, staining, and biochemical tests for the identification of clinically important bacteria.

CO3: Apply diagnostic protocols for respiratory, urinary, gastrointestinal, central nervous system, and bloodstream bacterial infections.

CO4: Analyze laboratory findings to identify bacterial pathogens and correlate them with clinical infections.

CO5: Evaluate antimicrobial susceptibility test results and quality control measures for accurate laboratory diagnosis.

Course Content: General Bacteriology Lab.

Topics	Hours
Unit-I	
1. Perform pure culture study of common pathogens. (<i>Staphylococcus aureus</i> , <i>Staphylococcus pyogenes</i> , <i>Enterococcus species</i> , <i>Corynebacterium diphtheriae</i> , <i>E. coli</i> , <i>Salmonella spp</i> , <i>Shigella spp</i> , <i>Pseudomonas</i> , <i>Proteus spp</i> , <i>K.</i>)	6
Unit-II	
1. Apply diagnostic Scheme for Respiratory Tract Infections. 2. Apply diagnostic Scheme for Urinary Tract Infections.	6
Unit-III	
1. Apply diagnostic for Gastrointestinal Tract Infections. 2. Apply diagnostic for Central Nervous System Infections and Bacteraemia.	6
Unit-IV	
1. Demonstrate bacterial identification and antibiotic susceptibility testing using manual /automated methods 2. Processing of specimens for anaerobic bacteria 3. Processing of specimens for mycobacteria	6
Unit-V	
1. Perform serological tests for the diagnosis of bacterial diseases 2. Identify the quality control used in the manual and automated methods	6

Suggested Reading:

1. Mackie & McCartney – *Practical Medical Microbiology*, Elsevier
2. Henry D. Isenberg – *Clinical Microbiology Procedures Handbook*, ASM Press
3. Bailey & Scott – *Diagnostic Microbiology*, Elsevier
4. Koneman et al. – *Colour Atlas and Textbook of Diagnostic Microbiology*, Lippincott

Program: - BMLT

Semester: - IV

Course: - Histopathology Lab.

Course Code: - 42ABMT033

L	T	P	C
0	0	2	1

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the basic principles of histology, tissue processing, and histopathological techniques.

CO2: Explain the functions of microscopes, laboratory instruments, glassware, fixatives, and chemicals used in histopathology.

CO3: Perform Haematoxylin and Eosin (H&E) staining using standard laboratory procedures.

CO4: Analyze the effects of tissue processing, fixatives, and staining techniques on cellular and tissue morphology.

CO5: Evaluate histological slides by differentiating normal tissue structures and staining characteristics.

Course Content: Histopathology Lab.

Topics	Hours
Unit-I	6
1. Basic Principles in Histology -Tissue Processing 2. Advance knowledge in Histology, histopathology and Histotechniques - Tissue Processing and preparations	
Unit-II	6
1. Study of various types of Microscopes (Light, Electron) 2. Study the various types of Instruments, glassware, fixative agents and chemicals	
Unit-III	6
1. To perform Haematoxylin & Eosin stain 2. To improve the knowledge of various types of sophisticated microscope (Simple and advances) and microtome (manual and semi- automated) Haematoxylin & Eosin stain	
Unit-IV	6
1. Morphological study of cells and tissues of specimen to be examined 2. Anatomical and morphological study of cells and tissues specimen and effects of chemical a staining agent	
Unit-V	6
1. Interpretation of Histological slides 2. Advance Interpretation of prepared Histological slides with the standard with different types of tissues specimen	

Suggested Reading:

1. Pathology Practical Book, Harsh Mohan; Jaypee Brothers Medical Publishers (P) Ltd.
2. Bancroft's Theory and practice of Histopathological Techniques, Kim S Suvarna, Christopher Layton, John D. Bancroft; Elsevier Health Sciences.
3. Histology Practical Manual, Balakrishna, Jaypee Brothers.

Program: - BMLT

Semester: - IV

Course: - Clinical Pathology Lab

Course Code: - 42ABMT034

L	T	P	C
0	0	2	1

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Identify and process various clinical specimens using standard laboratory procedures.

CO2: Perform physical, chemical, and microscopic examination of urine and stool specimens accurately.

CO3: Conduct routine laboratory investigations including urine special tests, semen analysis, and CSF examination.

CO4: Analyze laboratory findings of body fluids to differentiate normal and abnormal conditions.

CO5: Evaluate the quality and reliability of specimen processing and test results for accurate diagnosis.

Course Content: Clinical Pathology Lab

Topics	Hours
Unit-I	6
1. Identify and process clinical specimens (urine, stool, semen, sputum, CSF, pleural, peritoneal, synovial, pericardial fluids)	
2. Perform physical, chemical, and microscopic analysis of urine and stool	
Unit-II	6
1. Conduct special test in urine -haemoglobin & myoglobin, pregnancy test	
2. Perform Stool analysis – Physical, Chemical and Microscopic Examination	
Unit-III	6
1. Perform semen analysis- Physical, Chemical and Microscopic Examination	
2. Perform Cerebrospinal Fluid (CSF) examination - Physical, Chemical, and Microscopic Examination	
Unit-IV	6
1. Perform Sputum Analysis- physical, chemical, and microscopic examination	
2. Perform Pleural Fluid examination -physical, chemical, and microscopic examination	
Unit-V	6
1. Perform Synovial fluid examination- physical, chemical, and microscopic examination	
2. Perform Peritoneal Fluid examination- physical, chemical and microscopic examination	

Suggested Reading:

1. Godkar, P. B., & Godkar, D. P. (2006). *Textbook of medical laboratory technology*. Bhalani publishing house.
2. Sood, R. (2006). *Textbook of medical laboratory technology*. Jaypee Brothers Publishers.
3. Mundt, L., & Shanahan, K. (2020). *Graff's textbook of urinalysis and body fluids*. Jones & Bartlett Learning.
4. Strasinger, S. K., & Di Lorenzo, M. S. (2014). *Urinalysis and body fluids*. FA Davis.

Program: - BMLT

Semester: - IV

Course: - Hospital Infection Control

Course Code: - 42ABMT035

L	T	P	C
1	0	0	1

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Define the principles of hospital infection control.

CO2: Describe standard infection prevention practices, including hand hygiene, PPE, sterilization, and disinfection methods.

CO3: Explain biomedical waste management, laboratory biosafety, and occupational safety measures in healthcare settings.

CO4: Apply infection prevention and control measures to minimize the spread of infections in healthcare and laboratory settings.

CO5: Analyze infection surveillance data and outbreak investigation procedures to support effective infection control practices.

Course Content: Hospital Infection Control

Topics	Hours
Unit I: Introduction to Hospital Infection Control	3
Definition and importance of Hospital Infection Control (HIC)	
Healthcare-Associated Infections (HAIs): Definition and epidemiology	
Chain of infection, Reservoirs and sources of infection	4
Unit II: Infection Prevention and Control Practices	
Standard precautions, Transmission-based precautions	
Hand hygiene: WHO Five Moments of Hand Hygiene, Hand washing and hand rub techniques	
Personal Protective Equipment (PPE): Gloves, Masks, Gowns, Eye protection	
Sterilization and disinfection: Physical methods, Chemical methods, Monitoring of sterilization	4
Unit III: Biomedical Waste Management and Occupational Safety	
Biomedical Waste Management Rules, Categories and segregation of biomedical waste	
Colour coding and disposal methods, Sharps management	
Occupational hazards in healthcare laboratories	
Laboratory biosafety: Biosafety levels (BSL-1 to BSL-4), Safe laboratory practices, Spill management and decontamination procedures	4
Unit IV: Infection Surveillance and Quality Assurance	
Hospital Infection Control Committee (HICC): Structure, Functions	
Infection surveillance: Purpose, Types, Surveillance indicators	
Outbreak investigation: Steps in investigation, Control measures, Infection control audits.	
Role of Medical Laboratory Technologists in infection prevention	

Suggested Reading:

1. Ananthanarayan and Paniker's Textbook of Microbiology, Universities Press.
2. Essentials of Hospital Infection Control, Jaypee Brothers Medical Publishers.
3. Baveja C.P. Textbook of Microbiology, Arya Publications.

Program: - BMLT

Semester: - IV

Course: - Character Building & Holistic Development of Personality - II (Yoga and Physical Fitness)

Course Code: - 42AVAC- 002

L	T	P	C
2	0	0	2

Course Outcome:

On completion of the Course, the students will be able to:

CO 1: Develop a good understanding of spiritual and mental health.

CO 2: Adapt the concept of sustainability and development.

CO3: Demonstrate Yoga practices and healthy life style habits for physical well-being.

CO4: Apply yoga, pranayama, and self-care techniques to enhance physical and mental well-being.

Course Content: Character Building & Holistic Development of Personality - II

Topics	Hours
Unit I: Physical Vital Development - Health: Meaning, Concept, Dimensions of health (mental, physical, social and spiritual) and health related general habits. - Ideal daily routine/ Lifestyle: Meaning, Concept, Principles and its related practice - Balanced Diet: Meaning, Concept, Benefits, Alkali and Acid, Balanced Diet according to Desh (location), Kaal (time), Ayu (age) and Ritu (season) - Ritucharya (Seasonal Habits): Meaning, general Introduction, Concept, Month and Festivities according to season, Nature of Earth, Lifestyle according to Shishir Season. - Sukshama Vyayama and Surya Namaskara: General Introduction, Precautions and Practice.	4
Unit II: Yoga and its Importance - Yoga: Meaning, Concept, Aims and Objectives, Types. - Diet and Health: Conditions, Malnutrition (Undernutrition and Over Nutrition) causes, Problems and Solutions, Common points of consideration for nutrition. - Vasant Ritucharya: Lifestyle according to Spring season; Lifestyle- General Introduction, Concept, Month and Festivities according to season. - Pranayama: General Introduction (Bandh, Nadi and Chakra), Importance, Eligibility, Time, Place, position, Principles of Practice and Precautions - Asana: General Introduction, Types, Benefits, Precaution and Practice (Asanas in Standing position) - Practice of Sukshama Vyayama and Surya Namaskara	4
Unit III: Yoga and Physical Fitness - Ashtanga Yoga: General Introduction, Parts, Meaning of Yama and Niyama, Concept, aims and Objectives. - Diet and Health: Nutrients of Food -Carbohydrates, Proteins and Fats – Structure/Elements, Requirement/Utility & Sources - Grisham Ritucharya: Lifestyle according to summer season- General Introduction, Concept, Month and Festivities according to season, Nature of the Earth. - Pranayama: Importance, Rules, Precautions and Practice of Inhalation (Purak) Exhalation (Rechak) and Holding of Breath - Asanas: (Bending Asanas)- General Introduction, Benefits, Precautions and practice of Padhastasana, Utkataana, Garudasana, Tulasana and Ardgh-Chandrasana	8

• Practice of Sukshama Vyayama and Surya Namaskara • Varsha Ritucharya: Lifestyle according to rainy season- General Introduction, Concept, Month and Festivities according to season, Nature of the Earth. • Diet and Health: Nutrients of Food – Vitamins, Mineral and Water structures/elements, Requirement & Sources. • Pranayama: Importance, Rules, Precautions and Practice of Anuloma-Viloma, Bhramari and Kapalbhathi Pranayama • Asanas: (In Sitting Position) - General Introduction, Benefits, Precautions and practice. • Practice of Sukshama Vyayama and Surya Namaskara	
Unit IV: Practices of Yoga • Sharad Ritucharya: Lifestyle according to Autumn season- General Introduction, Concept, Month and Festivities according to season, Nature of the Earth. • Pranayama: Importance, Rules, Precautions and Practice of Chandrabhedhi, Suryabhedhi and Ujjai Pranayama. • Asanas: (asanas performed in Supine position) - General Introduction, Benefits, Precautions and practice. • Practice of Sukshama Vyayama and Surya Namaskara. • Hemant Ritucharya: According to Hemant season- Meaning, General Introduction, Concept, Month and Festivities according to season, Nature of the Earth. • Pranayama: Importance, Rules, Precautions and Practices of Sheetali, Sheetkari and Nadi Shodhan Pranayama. • Asanas: (asanas performed in Prone position) - General Introduction, Benefits, Precautions and practice. • Practice of Sukshama Vyayama and Surya Namaskara • Self Defense: Meaning, Purpose, Required Capabilities; • Relaxation: Shoulder-movement exercise for Spine & maintaining the balance • Marmasthala – Common Vulnerable/Vital Points • Prahara : Meaning, Striking Organs, Types of Strikes, Precautions. • Preventing possible strikes, Preventing Organs and types/uses	8

Suggested Reading:

- Yoga for Everyone, B.K.S.Iyengar, Dorling Kindersley Ltd; New Delhi
- Yoga the Path to Holistic Health, B.K.S.Iyengar, Dorling Kindersley Ltd; New Delhi
- Science of Yoga, Ann Swanson, Dorling Kindersley Ltd; New Delhi

Semester-V

Program: - BMLT

Semester: - V

Course: - General Virology

Course Code: - 42ABMT036

L	T	P	C
3	0	0	3

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Explain virus–host interactions, bacteriophage biology, and laboratory methods used for viral diagnosis.

CO2: Summarize the morphology, pathogenesis, clinical features, and laboratory diagnosis of Orthomyxoviruses, Paramyxoviruses, and Hepatitis viruses.

CO3: Apply appropriate laboratory techniques for the diagnosis of viral infections.

CO4: Analyze the epidemiology, transmission, and pathogenic mechanisms of major human viral diseases.

CO5: Develop suitable diagnostic and infection-control approaches for the management of common viral diseases using modern virological principles.

Course Content: General Virology

Topics	Hours
Unit-I Introduction to Virus	9
General Properties of Viruses: Morphology, Viral Hemagglutination, Viral Multiplication, Cultivation of Viruses- Animal inoculations, Egg inoculation, Cell culture, Viral Assay, Assay of Infectivity, Viral Genetics, Non- Genetic Interactions, Classification and Nomenclature of Viruses, Viroids, Prion; Viral genomics and bioinformatics tools	
Unit-II Virus- Host Interactions & Bacteriophages	9
Virus- Host Interactions: Viral Infections: Pathogenesis of Viral Infection, Host Response to Virus Infections; Laboratory Diagnosis of Viral Diseases, Immunoprophylaxis of Viral Diseases, Chemoprophylaxis and Chemotherapy of Virus Diseases; Bacteriophages: Morphology, life cycle, transmission of genetic information, significance of phages	
Unit-III Orthomyxoviruses & Paramyxoviruses	9
Orthomyxoviruses: Morphology, Resistance, Antigen classification; Influenza virus- classification, Nomenclature systems, Antigenic variation, Host range, Pathogenicity, Clinical features, Laboratory diagnosis, Immunity, Epidemiology. Paramyxoviruses: Antigenic Structure and classification • Rubella viruses, Mumps virus: Properties, clinical features, complications, Epidemiology, Immunity, Laboratory Diagnosis, Prophylaxis • Parainfluenza viruses: Clinical features, Epidemiology, Laboratory diagnosis, New Castle Disease viruses (NDV)	
Unit-IV Hepatitis viruses	9
Hepatitis viruses: types of viral hepatitis Type A Hepatitis (HAV), Type B Hepatitis (HBV), Type C Hepatitis (HCV), Type D Hepatitis (HDV), Type G Hepatitis (HGV)	
Unit-V Human Immunodeficiency Virus & Acquired Immune Deficiency Syndrome	9
Human Immunodeficiency Virus (HIV) Structure, Viral Genes and Antigens, Antigenic Variation and Diversity Of HIV, Resistance, Pathogenicity Acquired Immune Deficiency Syndrome (AIDS) Clinical features of HIV infection, Laboratory diagnosis, Strategies for HIV testing, Applications of serological tests, Epidemiology and prevention, Prophylaxis, Treatment	

Suggested Reading:

1. Jagdish Chander – *Textbook of Medical Mycology*, Jaypee Brothers Medical Publishers
2. George S. Fischer – *Fundamentals of Diagnostic Mycology*

Program: - BMLT

Semester: - V

Course: - Biomedical Instrumentation

Course Code: - 42ABMT037

L	T	P	C
2	0	0	2

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Define the basic principles of laboratory management, administration, and organization.

CO2: Explain the principles, operation, and maintenance of common laboratory instruments and glassware.

CO3: Demonstrate proper specimen collection, handling, record keeping, and reporting procedures.

CO4: Analyze laboratory workflow and administrative practices to improve efficiency and quality.

CO5: Develop appropriate laboratory management strategies in accordance with quality standards and national health programs.

Course Content: Biomedical Instrumentation

Topics	Hours
Unit – I: Laboratory Management and Administration	6
Introduction to basic terminology of the Laboratory Illustrate the principal planning of the Laboratory, Study of Laboratory Administration, different part of the Medical Lab.	
Unit – II Laboratory Instruments and Glass wares	6
Principle and Operation of Cell Counters and Biochemical Analyzers, Colorimeter, Spectrophotometer, Spectrofluorometric, pH meter, Elisa reader, Glucometers, Laboratory equipment and instrument, Laboratory wares and Glass wares Use and care of Laboratory Glass wares Maintenance, Cleaning and labelling of Glass wares	
Unit – III Laboratory responsibilities and Accidents	6
Duties and Responsibilities of Medical Laboratory Technician Common Laboratory Accidents, Uses of Instruments Laboratory Responsibilities and Accidents in IKS	
Unit – IV Specimen Collection and Record Keeping	6
Various types of Specimen collection and its process Dispatch, receiving and disposal of specimen, Requisition and reporting system; Laboratory records	
Unit – V Laboratory Accidents and Health Program	6
Factors causing Accident in Laboratory Demonstration of First Aid Kit Study of National Health Program	

Suggested Reading:

1. J.J. Karr & J.M. Brown, — Introduction to Biomedical Technology, Prentice Hall
2. R. S. Khandpur —Handbook of Biomedical Instrumentation, Tata McGraw-Hill
3. L. Crownwell —Biomedical Instrumentation and Measurement, Prentice-Hall
4. M. Arumugham —Biomedical Instrumentation, Anuradha Publications.

Program: - BMLT

Semester: - V

Course: - Clinical Serology

Course Code: - 42ABMT038

L	T	P	C
2	0	0	2

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the basic concepts of clinical serology, immunity, antigens, antibodies, and antigen–antibody reactions.

CO2: Explain the principles and applications of common serological techniques such as agglutination, precipitation, ELISA, and immunofluorescence.

CO3: Identify the serological tests used for the diagnosis of bacterial, viral, and parasitic diseases, pregnancy, and autoimmune disorders.

CO4: Perform and interpret routine serological tests for the diagnosis of infectious and autoimmune diseases.

CO5: Analyze serological test results and correlate findings with clinical conditions for accurate diagnosis.

Course Content: Clinical Serology

Topics	Hours
Unit I: Fundamentals of Clinical Serology	6
Introduction to Clinical Serology, Scope and applications of serology in disease diagnosis, Immunity: Innate and acquired immunity, Antigens: Structure, properties, and types, Antibodies (Immunoglobulins): Structure, classes (IgG, IgM, IgA, IgE, IgD), and functions, Antigen-antibody reactions: Principles and factors affecting serological reactions	
Unit II: Serological Techniques	6
Agglutination tests (Slide, Tube, Latex agglutination), Precipitation reactions Complement fixation test (Principle), Neutralization tests Immunofluorescence techniques (Direct and Indirect) Enzyme-Linked Immunosorbent Assay (ELISA): Principle, types, applications	
Unit III: Clinical Applications of Serology	6
Serological diagnosis of bacterial infections: Widal test, ASO (Antistreptolysin-O) test Serological diagnosis of viral infections: HIV screening, Hepatitis B (HBsAg), Hepatitis C, Dengue. Serological diagnosis of syphilis: VDRL/RPR tests Pregnancy testing (hCG detection) Interpretation and clinical significance of serological results	
Unit IV: Autoimmune Diseases, Quality Control and Laboratory Safety	6
Autoimmune disorders: Basic concepts, Rheumatoid Factor (RF) C-Reactive Protein (CRP), Antinuclear Antibody (ANA): Introduction Quality control in serology laboratory, Internal and external quality assurance Biosafety practices and waste disposal in serology laboratory Sources of error and troubleshooting in serological testing	

Suggested Reading:

1. **Ananthanarayan and Paniker's Textbook of Microbiology** – Reba Kanungo (Current Edition)
2. **Medical Laboratory Technology (Vol. I)** – Ramnik Sood
3. **Textbook of Microbiology** – R. Sasikala Bhat & Shriram Bhat

Program: - BMLT

Semester: - V

Course: - Blood Banking

Course Code: - 42ABMT039

L	T	P	C
2	0	0	2

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Explain the principles of immunohematology, blood group systems, and hemolytic disease of the newborn.

CO2: Describe donor selection criteria, blood collection procedures, and safe blood storage practices.

CO3: Perform compatibility testing, antibody screening, and blood component preparation using standard serological techniques.

CO4: Analyze complex immunohematological problems and interpret serological test results for safe transfusion practices.

CO5: Evaluate blood bank quality control measures, inventory management, and regulatory compliance to ensure patient safety.

Course Content: Blood Banking

Topics	Hours
Unit-I Introduction to Blood Banking	8
Advanced Immunohematology Principles: Principles of Immunohematology, Genetics of ABO blood group system, their subgroups, RBC antigens and consecutive antibodies, Genetics of Rh Blood group and antibodies, Minor blood group systems, Bombay blood group, ABO and Rh incompatibility, Hemolytic Disease of newborn and its management.	
Unit-II Blood collection and donor selection criteria	8
Blood collection and donor selection criteria: Donor Management: Donor registration and screening, Phlebotomy in blood banks, blood storage, various anticoagulants used in blood bags, types of blood bags used in blood banks Blood Collection & Processing: Whole blood collection, Adverse reactions and their management, Blood transmitted disease and their testing, Labelling, storage, and transportation of blood	
Unit-III Serologic Techniques & Component preparation	8
Serologic Techniques and Problem Solving: Blood compatibility tests, Antibody screening and identification, DAT and IAT optimization, Enzyme treatment, adsorption/elution techniques, Component preparation and storage: Apheresis vs whole blood donation, Component separation techniques, Storage, shelf-life, and transportation protocols, Hemovigilance in component therapy	
Unit-IV Regulatory, QC, and Ethics in Blood Banks	6
Regulatory, QC, and Ethics in Blood Banks: NABH, NACO, FDA, CDSCO guidelines, Quality management system (QMS), Inventory management, Incident reporting & blood bank audits, Regulatory framework: Drugs and Cosmetics Act, licensing of blood banks, GMP, GLP, SOPs, and NABH/NABL accreditation, Safety and biosafety in blood banks	

Program: - BMLT

Semester: - V

Course: - Forensics sciences & Ethics

Course Code: - 42ABMT040

L	T	P	C
2	0	0	2

Course Outcome:

On completion of the Course, the students will be able to:

CO1. Define the basic concepts of forensic science, medical ethics, jurisprudence, and Indian legal provisions related to forensic practice.

CO2. Describe the organization of forensic science laboratories and the principles used in the examination of biological fluids, trace evidence, and chromatography.

CO3. Explain the concepts of drugs, drug abuse, dependence, addiction, food poisoning, and different types of poisoning.

CO4. Apply forensic laboratory techniques to analyze biological samples and trace evidence in medico-legal investigations.

CO5. Differentiate between legal and illegal drugs, various types of poisoning, and recommend appropriate preventive and management measures in forensic contexts.

Course Content: Forensics sciences & Ethics

Topics	Hours
Unit-I Legal and ethical aspects of Forensic & medical ethics and related terms	6
Introduction of forensic sciences, legal and ethics. Basic principles of medical ethics and its type. Introduction to jurisprudence, scope and its significance. Introduction of laws of India; criminal laws, civil laws, types of inquest and offences.	
Unit-II Setup of Forensic Science laboratory and examination of biological fluids	6
Introduction and setup of forensic science laboratory and its applications. Investigation and examination of biological fluids, traces evidences and other materials by using different methods. Principle and applications of chromatography.	
Unit-III Introduction to drug, drug abuse and dependence	6
Introduction of drug and drug abuse. Function of legal and illegal drugs in forensics. Role and effects of Drug resistance, physical dependence, tolerance and related terms. Drug addiction, habituation, sign, symptoms and its solutions. Drug dependence, its prevention and management.	
Unit-IV Food Poison and different types of poisoning	6
Introduction of poison, food poisoning, sign and symptoms. Main reason for outbreak of food poisoning. Introduction of mushrooms, types, nutritional values and characteristics of poisonous mushrooms. Poisoning from vegetables, soybeans, bacteria and other forms of substances and their complications. Precaution, prevention and management of food poisoning.	
Unit-V Medico-legal Aspects of Medical Termination of Pregnancy Act, protocol, record and policy	6
Objective of medico-legal aspects of Medical Termination of Pregnancy Act (MTP). Procedure of legal abortion, consent and protocol. Medical termination, registered medical practitioner, confidential record and monitor quality of services. Condition not possible to perform termination of pregnancy and violation.	

Suggested Reading:

1. K. S. Narayan Reddy & O. P. Murty – *Essentials of Forensic Medicine and Toxicology*.
2. C. M. Francis – *Medical Ethics*.
3. Richard Saferstein – *An Introduction to Forensic Science*.

Program: - BMLT

Semester: - V

Course: - Medical Parasitology

Course Code: - 42ABMT041

L	T	P	C
3	0	0	3

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Describe the basic concepts of medical parasitology, host–parasite relationships.

CO2: Explain the morphology, life cycle, pathogenesis, clinical features, laboratory diagnosis.

CO3: Apply appropriate laboratory methods for the identification and diagnosis of parasitic infections based on parasite morphology, life cycle, and clinical presentation.

CO4: Differentiate and analyse the characteristics, transmission patterns, pathogenicity, and laboratory findings of major protozoan, helminthic, and arthropod-borne infections.

CO5: Evaluate parasite and vector control strategies, including environmental, chemical, biological, genetic, and integrated control approaches for public health management.

Course Content: Medical Parasitology

Topics	Hours
Unit-I Introduction to Medical Parasitology	9
Introduction to Medical Parasitology & Entomology: scope and relevance; classification of medically important parasites and arthropods; transmission types, host categories, global burden and disease impact, emerging threats. Types of animal association, parasitism, commensalism, symbiosis, host adaptation mechanisms	
Unit-II Protozoa	9
Protozoa: morphology, life cycle, pathogenesis, laboratory diagnosis, treatment and prevention of nonpathogenic: <i>Entamoeba coli</i> , <i>Endolimax nana</i> , <i>Iodamoeba butschlii</i> , Free living Amoebae: <i>Naegleria</i> , <i>Acanthamoeba</i> , Flagellates: <i>Trichomonas</i> , <i>Giardia lamblia</i> , <i>Leishmania</i> , <i>Trypanosoma</i> , Sporozoa: Malarial parasites, <i>Babesia</i> , <i>Toxoplasma gondii</i> , <i>Isospora belli</i> , <i>Cryptosporidium parvum</i> , <i>Cyclospora</i> , Microsporidia Ciliate: <i>Balantidium coli</i> .	
Unit-III Helminths, Trematodes, Cestodes & Nematodes	9
Helminths: Classify helminths; compare morphological features, transmission routes, and adaptation mechanisms. Trematodes: morphology, life cycle, pathogenesis, laboratory diagnosis, treatment and prevention of <i>Schistosoma</i> species, <i>Fasciola</i> species etc. Cestodes: morphology, life cycle, pathogenesis, laboratory diagnosis, treatment and prevention of <i>Taenia</i> species, <i>Echinococcus</i> species etc. Nematodes: morphology, life cycle, pathogenesis, laboratory diagnosis, treatment and prevention of Intestinal Nematodes: <i>Ascaris lumbricoides</i> , <i>Ancylostoma duodenale</i> etc.	
Unit-IV Introduction of Arthropods	9
Introduction of Arthropods: classify the arthropods of public health importance; distinguish between vector and vehicle; vector control strategies (environmental control, chemical control, biological control, genetic control) approaches; role of vehicles and vectors in disease spread; Integrated approaches for parasite and vector control in endemic settings; vector surveillance, resistance management. Antiparasitic drugs.	
Unit-V Arthropods of Medical Importance:	9
Arthropods of Medical Importance: morphology, life cycle, public health importance and control of Mosquitoes, Sandflies, Tse-tse fly etc. Host–Parasite Immunology: Immune mechanisms against parasites; antigenic variation; vaccine prospects. hypersensitivity reactions; immunodiagnostic assay interpretation.	

Suggested Reading:

1. C.K. Jayaram Paniker, *Paniker's Textbook of Medical Parasitology*, Jaypee Brothers Medical Publishers
2. D.R. Arora & B. Arora – *Medical Parasitology*, CBS Publishers & Distributors

Program: - BMLT

Semester: - V

Course: - Cytopathological Techniques

Course Code: - 42ABMT042

L	T	P	C
2	0	0	2

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Explain the basic concepts, scope, principles, and applications of cytopathology and normal cell morphology.

CO2: Describe the methods of cytological specimen collection, handling, fixation, and processing following laboratory safety practices.

CO3: Perform routine cytological staining techniques and demonstrate proper smear preparation and preservation.

CO4: Analyze cytological specimens to differentiate normal, inflammatory, benign, and malignant cellular changes.

CO5: Integrate cytopathological knowledge with laboratory ethics, documentation, and biomedical waste management to support effective diagnostic practice.

Course Content: Cytopathological Techniques

Topics	Hours
Unit I: Introduction to Cytopathology and Cell Morphology	8
Introduction, history, scope, and applications of cytopathology Basic structure and morphology of normal cells, Cellular adaptations, degeneration, and cell injury, Principles of exfoliative cytology and aspiration cytology, Types of cytological specimens and indications, Cytopathology laboratory organization and biosafety measures	
Unit II: Cytological Specimen Collection and Processing	8
Collection of cytological specimens: 1. Exfoliative cytology 2. Fine Needle Aspiration Cytology (FNAC) 3. Body fluid cytology, Specimen handling, labeling, transportation, and preservation, Preparation of cytological smears, Fixation methods and commonly used fixatives, Cytoentrifugation and liquid-based cytology (overview), Quality control during specimen processing	
Unit III: Cytological Staining Techniques	7
Principles and applications of cytological staining. Papanicolaou (Pap) stain, May-Grünwald Giemsa (MGG) stain, Hematoxylin and Eosin (H&E) stain in cytology, Special stains used in cytopathology (overview), Mounting, preservation, and storage of stained smears, Quality assurance in staining procedures	
Unit IV: Diagnostic Cytopathology and Quality Assurance	7
Cytological features of inflammatory lesions Benign and malignant cellular changes Cytology of cervical lesions and Pap smear screening Cytology of respiratory tract, thyroid, breast, lymph node, and body fluids (overview) Reporting systems and documentation in cytopathology Internal quality control, external quality assurance, laboratory ethics, and biomedical waste management	

Suggested Reading:

1. Koss' Diagnostic Cytology and Its Histopathologic Bases – Leopold G. Koss & Myron R. Melamed.
2. Comprehensive Cytopathology – Marluce Bibbo & David Wilbur.
3. Textbook of Pathology – Harsh Mohan.
4. Medical Laboratory Technology: Methods and Interpretations (Vol. II) – Ramnik Sood.

Program: - BMLT

Semester: - V

Course: - Clinical Serology Lab.

Course Code: - 42ABMT043

L	T	P	C
0	0	2	1

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Recall laboratory safety practices, PPE usage, and serum separation and storage procedures.

CO2: Explain the preparation of reagents, controls, and the principles of common serological tests.

CO3: Perform latex agglutination tests for CRP, RF, and ASO following standard laboratory procedures.

CO4: Interpret the results of serological and immunological tests to support clinical diagnosis.

CO5: Assess the accuracy and reliability of serological test results using quality control procedures.

Course Content: Clinical Serology Lab.

Topics	Hours
Unit-I	6
Laboratory safety practices and use of PPE. Serum separation and storage.	
Unit-II	6
Preparation of reagents and controls. Latex agglutination test for C-Reactive Protein (CRP).	
Unit-III	6
Rheumatoid Factor (RF) latex agglutination test. Anti-Streptolysin O (ASO) latex agglutination test.	
Unit-IV	6
Widal tube agglutination test. VDRL slide test (demonstration/observation if patient samples are unavailable). Pregnancy test by rapid immunochromatographic method.	
Unit-V	6
ELISA technique (demonstration/principle and interpretation). Rapid card tests for Hepatitis B surface antigen (HBsAg). Quality control procedures in serology laboratory.	

Suggested Reading:

1. Immunology & Serology in Laboratory Medicine – Mary Louise Turgeon.
2. Medical Laboratory Technology (Vol. II) – Kanai Lal Mukherjee.
3. Ananthanarayan and Paniker's Textbook of Microbiology – Reba Kanungo.

Program: - BMLT

Semester: - V

Course: - Medical Parasitology Lab.

Course Code: - 42ABMT044

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Course Outcome:

On completion of the Course, the students will be able to:

CO1: Recall the principles of specimen handling, biosafety, and laboratory safety practices used in parasitology.

CO2: Explain wet mount preparation, concentration methods, staining techniques, and the morphology of common parasites.

CO3: Carry out serological diagnostic tests for parasitic infections and interpret basic laboratory results accurately.

CO4: Analyze microscopic findings to differentiate clinically important parasites and correlate them with disease conditions.

CO5: Evaluate laboratory observations and serological test results to support the diagnosis of parasitic infections.

Course Content: Medical Parasitology Lab.

Topics	Hours
Unit-I	8
1. Specimen Handling and Biosafety-safe specimen collection, transport, labelling, and disposal procedures, Use of PPE and biosafety guidelines, and sample handling.	
2. Wet Mount Preparation & Microscopy -Saline and iodine mounts; faecal smear preparation and observation; parasite sketching and labelling	
Unit-II	8
1. Concentration & Staining Methods- Flootation and sedimentation techniques; basic stains (Giemsa, methylene blue); image-based interpretation	
2. Identification of Helminth Ova and Larvae- Morphology of ova and larval stages under microscope; faecal concentration spotters	
Unit-III	8
1. Blood Parasite Detection-Thick and thin blood smear preparation; Giemsa staining; malaria and filarial parasite detection	
2. Arthropod Identification - using charts, preserved samples, shared slides	
Unit-IV	6
1. Case Scenario Integration - disease link discussion; mapping activity with clinical cues	
2. Serological Diagnostic Techniques - ELISA and rapid card tests for parasitic infections; result interpretation and trouble-shooting	

Suggested Reading:

1. K.D. Chatterjee – *Parasitology in Relation to Clinical Medicine*, CBS Publishers & Distributors
2. Praful B. Godkar – *Textbook of Medical Microbiology and Parasitology*, Bhalani Publishing House
3. K. Park – *Park's Textbook of Preventive and Social Medicine*, Banarsidas Bhanot Publishers

Program: - BMLT

Semester: - V

Course: - Character Building & Holistic Development of Personality - III
(Universal Human Values and Ethics)

Course Code: - 42AVAC- 003

L	T	P	C
2	0	0	2

Course Outcome:

On completion of the Course, the students will be able to:

CO 1: Understand the importance of Panchkosha in personality development and well-being.

CO 2: Learn to adapt, protect and preserve values and ethics.

CO3: Become a responsible citizen for serving the mankind.

CO4: Develop one's personality holistically in a balanced manner.

Course Content: Character Building & Holistic Development of Personality - III

Topics	Hours
Unit I: Personality Development	6
- Personality Development: Meaning, Concept, Constituent elements of personality and Means/Ways of Personality Development. - Panchakosha: General Introduction, Meaning, Objectives, Characteristics and Significance. - Benefits of Panchakosha, development and deficiencies due to underdevelopment of Panchkosha.	
Unit II: Mental Emotional Development	6
- Values and Individual: Non-Possession, Non- Stealing, Self-Restrain, Enthusiasm, Dutifulness, Reticence, Silence, Self-study, Considerateness and Self-respect. - Values and Family: Respectful Salutation, Obedience, Contentment, Patience, hospitality, Parent Service, Rectitude, Good Behaviour, Family feeling and worship.	
Unit III: Indian Values	6
- Values and Society: Discipline, Social Responsibility and Duties of Citizens, Altruism/ Charity, keeping good company, Gratefulness, Fraternity/ Friendship, Courtesy, Tactfulness, Soft Spoken and Feeling for the Oppressed. - Values and Constitution: Dignity of an Individual, Fundamental Duties, Fundamental rights, Directive Principles of State Policies, Social Equality, Democracy, Justice, Freedom, Sarva-Pantha Samman and Scientific Approach.	
Unit IV: Practice of Values and Ethics	6
- Values and Indian Culture: Integrity of the nation, Glory of the Past, Swadeshi, Nation Building, Patriotism, Mother Tongue, National Unity, Public Welfare, Equality and Spirituality. - Values and Vision of the World: Humanity, Integrity, Human rights, The Highest or Most Sublime Good, Vasudhaiva Kutumbakam, Tolerance, Peaceful Coexistence, World-Welfare, Environmental Protection, Swavalamban/Self-reliance	

Suggested Reading:

- My Idea of Education, Swami Vivekanand, Advaita Ashram, Kolkata
- Personality Development, Swami Vivekananda, Advaita Ashram, Kolkata.
- The Man India Missed the Most; Subhash Chandra Bose, huwan Lall, Notion Press, Chennai