ARYAVART INTERNATIONAL UNIVERSITY

Tilthai, Dharmanagar, North Tripura-799250

Syllabus for BMLT

Semester 1

Theory									
Course Code	**Topic**	**L**	**T**	**P**	**Credit**	**Theory Marks**	**Internal Marks**	**Practical Marks**	**Total Marks**
25ML101	Human Anatomy-I	3	0	0	3	70	30	0	100
25ML102	Human Physiology-I	3	0	0	3	70	30	0	100
25ML103	Basic Biochemistry	3	0	0	3	70	30	0	100
25ML104	General Microbiology	3	0	0	3	70	30	0	100
25ML105	Basic Pathology and Haematology	3	0	0	3	70	30	0	100
25ML191	Human Anatomy-I Practical	2	0	0	2	0	20	30	50
25ML192	Human Physiology-I Practical	2	0	0	2	0	20	30	50
25ML193	Basic Biochemistry Practical	2	0	0	2	0	20	30	50
25ML194	General Microbiology Practical	2	0	0	2	0	20	30	50
25ML195	Basic Pathology and Haematology Practical	2	0	0	2	0	20	30	50
	Total				**25**	**350**	**250**	**150**	**750**

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Detailed Syllabus

HUMAN ANATOMY-I

Code: 25ML101
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide students with a foundational understanding of the structure and organization of the human body. It introduces the anatomy of major systems, emphasizing normal morphology and interrelationships of organs. The objective is to develop basic knowledge essential for understanding clinical diagnostics and laboratory procedures.

UNIT I **(10 Hrs)**

Introduction: Human Body as a whole

- Definition of anatomy and its subdivisions
- Anatomical nomenclature and terminology (planes & positions)
- Surface Anatomy of main structures and vessels

Applied Anatomy and Joints

- Musculoskeletal system
- Connective tissue & its modification, tendons, membranes, special connective tissue.
- Bone structure, blood supply, growth, ossification, and classification.
- Muscle classification, structure, and functional aspects.
- Joints classification, structures of joints, movements, range, limiting factors, stability, and blood supply
- Nerve supply, dislocations, and applied anatomy

UNIT II **(10 Hrs)**

Extremity (Lower & Upper extremities)

- Bony architecture
- Joints – structure, range of movement
- Muscles – origin, insertion, actions, nerve supply
- Major nerves – course, branches, and implications of nerve injuries
- Development of limb bones, muscles, and anomalies
- Radiographic identification of bone and joints, Applied anatomy

Lower extremity

- Bony architecture
- Joints – structure, range of movement
- Muscles – origin, insertion, actions, nerve supply
- Major nerves – course, branches, and implications of nerve injuries
- Development of limb bones, muscles, and anomalies
- Radiographic identification of bone and joints, Applied anatomy

UNIT III **(07 Hrs)**

Spine and Thorax

- Back muscles -Superficial layer
- Deep muscles of the back, their origin, insertion, action, and nerve supply.
- Vertebral column – Structure & Development, Structure & Joints of vertebra.
- Thoracic cage

Head and neck

- Cranium Facial Muscles – origin, insertion, actions, nerve supply
- Temporomandibular Joints – structure, types of movement

UNIT IV **(06 Hrs)**

Cardiovascular system (with relevant applied anatomy)

- Heart-Size, location, chambers.
- Circulation -Systemic & pulmonary
- Great vessels of the heart, branches of the aorta.
- Overview of blood vessels of the upper extremity and lower extremity

Lymphatic system- (with relevant applied anatomy)

- Salient features of lymphatic organs (spleen, tonsil, thymus, lymph node)

UNIT V **(07 Hrs)**

Gastrointestinal system (with relevant applied anatomy)

- Parts of the gastrointestinal tract
- Gross anatomy of the Tongue, stomach, small and large intestine, liver, gall bladder
- Pancreas and other digestive organs & related applied anatomy

Respiratory system (with relevant applied anatomy)

- Parts of the respiratory system with salient gross features of the lung
- Brief description of intercostal muscles and Paranasal air sinuses

Text Books:

1. B.D. Chaurasia, *Human Anatomy (Vol. 1)*, CBS Publishers & Distributors, New Delhi, 2020.
2. Inderbir Singh, *Textbook of Anatomy (Vol. 1)*, Jaypee Brothers Medical Publishers, New Delhi, 2019.
3. A.K. Datta, *Essentials of Human Anatomy (Vol. 1)*, Current Books International, Kolkata, 2018.
4. Ross & Wilson, *Human Anatomy and Physiology*, Elsevier, 2019.

References:

1. Richard L. Drake, A. Wayne Vogl & Adam W. M. Mitchell, *Gray's Anatomy for Students*, Elsevier, 2020.
2. Keith L. Moore, *Clinically Oriented Anatomy*, Wolters Kluwer, 2018.
3. Richard S. Snell, *Snell's Clinical Anatomy*, Wolters Kluwer, 2019.
4. Frank H. Netter, *Atlas of Human Anatomy*, Elsevier, 2018.

HUMAN PHYSIOLOGY-I

Code: 25ML102
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide foundational knowledge of human physiological mechanisms essential for understanding normal body functions. It enables students to comprehend the structure–function relationships of major organ systems, including blood, nerves, and muscles. The objective is to build a strong base for clinical laboratory practices by correlating physiological processes with diagnostic parameters.

UNIT I **(08 Hrs)**

General Physiology

- Cell: morphology, Structure, and function of cell organelles
- Structure of the cell membrane
- Transport across the cell membrane
- Intercellular communication

Homeostasis Blood

- Introduction-composition & function of blood W.B.C., R.B.C., Platelets formation & functions, Immunity
- Plasma: composition, formation & functions, Plasma Proteins: -types & functions, Blood Groups types, significance, determination.
- Haemoglobin, Haemostasis
- Lymph-composition, formation, circulation & functions

UNIT II **(10 Hrs)**

Cardiovascular system

- Conducting system components, impulse conduction
- Heart valves, Cardiac cycle definition, and phases of cardiac cycle.
- Cardiac output-definition, normal value, determinants.
- Stroke volume and its regulation.

- Heart rate and its regulation: Arterial pulse, Blood pressure definition, normal values, factors affecting blood pressure.
- Shock-definition, classification, causes and features, Basic idea of ECG, Cardiovascular changes during exercise

UNIT III **(08 Hrs)**

Respiratory System

- Mechanics of respiration
- Lung volumes and capacities
- Pulmonary circulation, transport of respiratory gases
- Factors affecting respiration, Regulation of respiration-neural regulation, voluntary control, and chemical regulation
- Hypoxia, Hypercapnoea, Hypocapnoea, Artificial respiration
- Disorders of respiration- dyspnoea, orthopnoea, hyperpnoea, hyperventilation, apnoea, Tachypnoea,
- Respiratory changes during exercise.

Digestive System

- Digestion & absorption of nutrients, Gastrointestinal secretions & their regulation
- Functions of Liver & Stomach

UNIT IV **(14 Hrs)**

Nervous system

- Introduction, central and peripheral nervous system, functions of the nervous system
- Reflexes- monosynaptic, polysynaptic, superficial, deep & withdrawal reflex
- Sense organ, receptors, electrical & chemical events in receptors.
- Sensory pathways for touch, temperature, pain, proprioception & others.
- Control of tone & posture: Integration at spinal, brain stem, cerebellar, and basal ganglion levels, along with their functions.
- Motor mechanism: motor cortex, motor pathway: the descending tracts -pyramidal & extrapyramidal tracts-origin, course, termination & functions.
- Upper motor neuron and lower motor neuron paralysis.
- Special senses-eye, ear, nose, mouth
- Water excretion, concentration of urine-regulation of Na+, Cl-, K+ excretion

Nerve Muscle Physiology

- Muscles-classification, structure, properties, Excitation, contraction, coupling, Motor unit, EMG, factors affecting muscle tension, Muscle tone, fatigue, exercise
- Nerve – structure and function of neurons, classification, properties
- Resting membrane potential & Action potential: their ionic basis, All or None phenomenon, Neuromuscular transmission, Ionic basis of nerve conduction.
- Concept of nerve injury &Wallerian degeneration Synapses.
- Electrical events in postsynaptic neurons
- Inhibition & facilitation at synapses
- Chemical transmission of synaptic activity
- Principal neurotransmitters
- Chemical transmission of synaptic activity: Principal neurotransmitters.

Text Books:

1. A.C. Guyton & J.E. Hall, *Textbook of Medical Physiology*, Elsevier, 2021.
2. Sujit K. Chaudhuri, *Concise Medical Physiology*, New Central Book Agency, Kolkata, 2018.
3. R.C. Guyton, *Basic Human Physiology*, CBS Publishers & Distributors, New Delhi, 2019.
4. Sarada Subrahmanyam, *Textbook of Physiology*, S. Chand Publishing, 2018.

References:

1. John E. Hall, *Guyton and Hall Review of Medical Physiology*, Elsevier, 2020.
2. Linda S. Costanzo, *Physiology*, Elsevier, 2019.
3. William F. Ganong, *Review of Medical Physiology*, McGraw-Hill, 2017.
4. Arthur C. Guyton, *Human Physiology and Mechanisms of Disease*, Elsevier, 2019.

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BASIC BIOCHEMISTRY

Code: 25ML103
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to introduce students to the fundamental biochemical molecules and their roles in maintaining normal cellular functions. It helps learners understand basic metabolic pathways, enzyme functions, and biochemical reactions essential for life. The objective is to prepare students for clinical laboratory applications by linking biochemical principles with diagnostic and analytical techniques.

UNIT I: Carbohydrates **(12 Hrs)**

- Definition, function, and classification of carbohydrates.
- Monosaccharide, glycoside formation, oligosaccharides, and polysaccharides.
- Glycolysis, catabolic fates of pyruvate, metabolic fate of Acetyl-CoA, Citric acid cycle, gluconeogenesis, glycogen metabolism, and pentose phosphate pathway.

UNIT II: Amino Acids and Proteins **(15 Hrs)**

- Definition, structure, classification, essential & non-essential amino acids.
- Proteins definition and classification.
- Primary, secondary, tertiary, and quaternary of proteins of proteins

UNIT III: Vitamins **(07 Hrs)**

- Definition and classification of vitamins, difference between fat-soluble and water-soluble vitamins.
- Water-soluble vitamins and fat-soluble vitamins

UNIT IV: Lipids **(06 Hrs)**

- Definition, classification, and function of lipids.
- Fatty Acids, Triacylglycerols, or Triacylglycerides or neutral fat.
- Fatty acid metabolism.
- Ketone body metabolism

Text Books:

1. Satyanarayana U. & Chakrapani U., *Biochemistry*, Elsevier, 2020.
2. Vasudevan D.M., Sreekumari S. & Vaidyanathan K., *Textbook of Biochemistry for Medical Students*, Jaypee Brothers Medical Publishers, 2019.
3. Deb A.C., *Fundamentals of Biochemistry*, New Central Book Agency, Kolkata, 2018.
4. Jain J.L., Jain S. & Jain N., *Fundamentals of Biochemistry*, S. Chand Publishing, 2017.

References:

1. Lehninger, Nelson D.L. & Cox M.M., *Lehninger Principles of Biochemistry*, W.H. Freeman, 2017.
2. Harper's Illustrated Biochemistry, Rodwell V., Bender D. et al., McGraw Hill, 2018.
3. Voet D. & Voet J.G., *Biochemistry*, Wiley, 2018.
4. Berg J.M., Tymoczko J.L. & Gatto G.J., *Biochemistry*, W.H. Freeman, 2017.

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GENERAL MICROBIOLOGY

Code: 25ML104
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide fundamental knowledge of microorganisms, their classification, structure, and biological activities. It enables students to understand microbial growth, reproduction, and pathogenicity. The objective is to develop essential laboratory skills for handling microorganisms safely and to relate microbiological principles to clinical diagnostic practices.

UNIT I: Safety measures in laboratory **(08 Hrs)**

- Microscopy: Principle, working, and applications of the Light microscope, Dark field, Phase contrast microscopy, Fluorescent & Electron microscopy
- Sterilization and Disinfection: Physical Methods of Sterilization, Chemical Methods of Sterilization, Methods of Disinfection

UNIT II **(12 Hrs)**

- Introduction and classification of Bacteria, Morphology of bacteria, Growth, Nutrition & Metabolism of Bacteria
- Normal microbial flora of the human body, role of normal flora, probiotics.
- Bacterial genetics- Bacterial DNA & RNA, Replication of bacteria.
- Microbial pathogenicity

UNIT III **(10 Hrs)**

- Bacterial Culture and Identification: Culture Media & Transport Media, Aerobic Bacterial Culture Techniques, Anaerobic Bacterial Culture Techniques, Sample collection and transport methods
- Bacterial identification techniques: Conventional methods, Automated culture techniques.

UNIT IV **(10 Hrs)**

- Smear preparation & Staining methods: Gram stain, Acid-fast stain, Negative stain, Spore stain
- Antimicrobial susceptibility testing: Principles and techniques of Diffusion Methods
- Dilution Methods
- Preservation techniques of bacteria

Text Books:

1. Pelczar M.J., Chan E.C.S. & Krieg N.R., *Microbiology*, McGraw-Hill, 2018.
2. Prescott L.M., Harley J.P. & Klein D.A., *Prescott's Principles of Microbiology*, McGraw-Hill, 2019.
3. Ananthanarayan R. & Paniker C.K.J., *Textbook of Microbiology*, Universities Press, 2017.
4. Frobisher M., *Fundamentals of Microbiology*, W.H. Freeman, 2018.

References:

1. Tortora G.J., Funke B.R. & Case C.L., *Microbiology: An Introduction*, Pearson, 2019.
2. Gerard J. Tortora, *Principles of Microbiology*, Pearson, 2018.
3. Talaro K.P. & Chess B., *Foundations in Microbiology*, McGraw-Hill, 2018.
4. Jawetz, Melnick & Adelberg, *Medical Microbiology*, McGraw-Hill, 2019.

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BASIC PATHOLOGY AND HAEMATOLOGY

Code: 25ML105
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to introduce students to the fundamental concepts of disease processes, cellular injury, inflammation, and tissue responses. It provides an understanding of basic haematological parameters, blood cell morphology, and common blood disorders. The objective is to develop foundational skills required for performing routine pathology and haematology laboratory investigations with accuracy and safety.

UNIT I **(06 Hrs)**

- Pathology & its branches
- Normal cell and its functions
- Various types of microscopes & light microscope in detail.

UNIT II **(10 Hrs)**

- Introduction to haematology and laboratory Organization.
- Formation of Blood Composition and functions of blood
- Various anticoagulants, their uses, mode of action, and their merits & demerits.
- Collection & preservation of blood for various haematological investigations.

UNIT III **(10 Hrs)**

- Normal haematological indices (MCV, MCH, MCHC, PCV)
- Normal and absolute values in haematology.
- Quality assurance in haematology.
- Various methods of estimation of Hb involved and standardization of the instrument.

UNIT IV **(14 Hrs)**

- Haemocytometer: - Procedure of cell count, visual as well as electronic red cell, leucocytes, and platelet count.
- Romanowsky dyes, preparation, and staining procedure of blood smears.
- Morphology of normal blood cells and their identification.
- ESR & Factors influencing ESR and various procedures for its estimation.

Text Books:

1. Harsh Mohan, *Textbook of Pathology*, Jaypee Brothers Medical Publishers, 2019.
2. Robbins & Cotran, *Essentials of Pathology*, Elsevier, 2018.
3. Ramadas Nayak & Rakshitha Nayak, *Fundamentals of Pathology*, Jaypee Brothers Medical Publishers, 2017.
4. S.K. Sood, *Textbook of Medical Laboratory Technology (Pathology & Haematology)*, Jaypee Brothers Medical Publishers, 2018.

References:

1. Vinay Kumar, Abul Abbas & Jon Aster, *Robbins and Cotran Pathologic Basis of Disease*, Elsevier, 2020.
2. Barbara A. J. Bain, *Dacie and Lewis Practical Haematology*, Elsevier, 2019.
3. John Lukens, *Wintrobe's Clinical Hematology*, Wolters Kluwer, 2018.
4. R. Bhargava & I. Bhargava, *Practical Pathology and Haematology*, CBS Publishers & Distributors, 2017.

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HUMAN ANATOMY-I PRACTICAL

Code: 25ML191
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide a hands-on understanding of the structural organization of the human body through practical identification of bones, organs, and anatomical landmarks. It helps students develop skills in specimen handling, labelling, and basic anatomical observations. The objective is to strengthen foundational anatomical knowledge essential for clinical, laboratory, and diagnostic applications.

1. Identification and description of all anatomical structures.
2. Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face and brain).
3. Demonstration of skeleton-articulated and disarticulated.
4. Surface anatomy: Surface land mark-bony, muscular, and ligamentous. Surface anatomy of major nerves, arteries of the limbs.

HUMAN PHYSIOLOGY-I PRACTICAL

Code: 25ML192
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide practical exposure to basic physiological experiments related to blood, nerve, and muscle functions. It enables students to develop skills in recording, analyzing, and interpreting physiological parameters. The objective is to strengthen conceptual understanding of physiological processes and prepare students for clinical and diagnostic laboratory applications.

1. Haemoglobinometry
2. White Blood Cell count
3. Red Blood Cell count
4. Determination of Blood Groups
5. Leishman's staining and Differential WBC count
6. Determination of packed cell Volume
7. Erythrocyte sedimentation rate [ESR]
8. Calculation of Blood indices
9. Determination of Clotting Time, Bleeding Time

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BASIC BIOCHEMISTRY PRACTICAL

Code: 25ML193
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on experience in fundamental biochemical techniques, including analysis of carbohydrates, proteins, lipids, and enzymes. It enables students to develop skills in performing laboratory tests, handling reagents, and interpreting results accurately. The objective is to strengthen practical understanding of biochemical principles and their relevance in clinical laboratory diagnostics.

1. Identification of carbohydrates by Molisch's test.
2. Identification of reducing sugar by Benedict's test.
3. Identification of ketose sugars by Seliwanoff's test.
4. Identification of reducing sugar by the Osazone test.
5. Identification of cholesterol by Salkowski's test.
6. Identification of protein by Biuret's test.
7. Identification of protein by the Ninhydrin test.

GENERAL MICROBIOLOGY PRACTICAL

Code: 25ML194
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on training in basic microbiological techniques, including staining, culture, and microscopic observation of microorganisms. It enables students to develop skills in aseptic handling, identification, and analysis of microbial specimens. The objective is to build practical competence essential for clinical and diagnostic laboratory work.

1. Microscope
   Light Microscope
2. Staining
   Grams staining
   ZN staining
   Negative stain
3. Preparation of commonly used culture media
   Nutrient Agar
   Blood Agar
   Chocolate agar
   Mac Conkey agar
   Muller-Hinton agar
4. Culture methods
   Streak method
   Lawn method
   Stroke method
   Stab method
   Pour Plate method
   Liquid method
5. Antibiotic susceptibility test
   Diffusion methods
   Dilution Methods

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BASIC PATHOLOGY AND HAEMATOLOGY PRACTICAL

Code: 25ML195
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide practical training in basic pathology and haematology techniques, including blood cell counting, staining, and examination of blood and tissue samples. It helps students develop skills in accurate observation, recording, and interpretation of pathological and haematological findings. The objective is to prepare students for routine diagnostic and laboratory procedures with precision and safety.

1. Haemoglobin estimation – Sahli's method
2. Peripheral blood film (PFB), Preparation, staining by Leishman stain & examination.
3. Cell counts by Neubauer chamber – RBCs, WBCs, Platelets.
4. ESR & PCV estimation

Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 mark each (1x10 = 10)
Answer any 10 out of 12 (Short 50-70 Words): 3 marks each (3x10 = 30)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 30 marks. The average of the two scores will be considered and scaled to 15 marks for the final assessment. Additionally, 5 marks will be awarded for assignments submitted, 5 for attendance, and 5 for general proficiency, for a total of 30 internal assessment marks.

Lab

Practical: 50 Marks
External: 30 Marks
Internal: 20 Marks

External Assessment: 30 Marks
Major Experiment: 12 marks
Minor Experiment: 08 marks
Viva: 05 marks
Practical record: 05 marks

Internal Assessment: 20 Marks
Experiment: 05 marks
Practical record: 05 marks
Attendance: 05 marks
Viva: 05 marks

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Syllabus for BMLT

Semester 2

Theory									
Course Code	**Topic**	**L**	**T**	**P**	**Credit**	**Theory Marks**	**Internal Marks**	**Practical Marks**	**Total Marks**
25ML201	Human Anatomy-II	3	0	0	3	70	30	0	100
25ML202	Human Physiology-II	3	0	0	3	70	30	0	100
25ML203	Laboratory Apparatus, Reagents, and Concepts of SI Units	3	0	0	3	70	30	0	100
25ML204	Basic Concepts of Immunology and Systemic Bacteriology	3	0	0	3	70	30	0	100
25ML205	Systemic and Clinical Pathology	3	0	0	3	70	30	0	100
25ML291	Human Anatomy-II Practical	2	0	0	2	0	20	30	50
25ML292	Human Physiology-II Practical	2	0	0	2	0	20	30	50
25ML293	Laboratory Apparatus, Reagents, and Concepts of SI Units Practical	2	0	0	2	0	20	30	50
25ML294	Basic Concepts of Immunology and Systemic Bacteriology Practical	2	0	0	2	0	20	30	50
25ML295	Systemic and Clinical Pathology Practical	2	0	0	2	0	20	30	50
	Total				**25**	**350**	**250**	**150**	**750**

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Detailed Syllabus

HUMAN ANATOMY-II

Code: 25ML201
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide a detailed understanding of the human body's organ systems, including the cardiovascular, respiratory, digestive, and urogenital systems. It enables students to understand anatomical structures, their relationships, and functional relevance. The objective is to establish a robust foundation for clinical applications, laboratory practices, and advanced studies in the medical and allied health sciences.

UNIT I: Urinary system (with relevant applied anatomy) (06 Hrs)

- Parts of the urinary system
- Salient gross features of the kidney, urinary bladder, ureter, and urethra.

UNIT II: Reproductive System (06 Hrs)

- Parts of the male and female reproductive system with salient gross features of the testis & uterus, ovary, and fallopian tube

UNIT III (10 Hrs)

Endocrine Glands

- List of the endocrine glands, their position, and salient gross features
- Hormones produced by each endocrine gland

Embryology

- Spermatogenesis & oogenesis
- Ovulation, fertilization, Placenta, Foetal circulation

UNIT IV: Nervous System (12 Hrs)

- Classification of the nervous system, Definitions of the central, peripheral, and autonomic nervous system
- Neuron- structure and classification, neuroglia
- Names of lobes of Cerebrum and cerebellum, Parts of brainstem (salient features only)
- Cerebrospinal fluid and its circulation, names of cranial nerves, spinal nerve, meninges, ventricles (salient features only)

UNIT V: Sensory Organs (06 Hrs)

- Skin: Its appendages and functions
- Eye: Parts of the eye and its structure
- Ear: Parts of the ear- external, middle, and inner ear and contents.

Text Books:

1. B.D. Chaurasia, *Human Anatomy (Vol. 2)*, CBS Publishers & Distributors, New Delhi, 2020.
2. Inderbir Singh, *Textbook of Anatomy (Vol. 2)*, Jaypee Brothers Medical Publishers, New Delhi, 2019.
3. A.K. Datta, *Essentials of Human Anatomy (Vol. 2)*, Current Books International, Kolkata, 2018.
4. Ross & Wilson, *Human Anatomy and Physiology*, Elsevier, 2019.

References:

1. Richard L. Drake, A. Wayne Vogl & Adam W. M. Mitchell, *Gray's Anatomy for Students*, Elsevier, 2020.
2. Keith L. Moore, *Clinically Oriented Anatomy*, Wolters Kluwer, 2018.
3. Richard S. Snell, *Snell's Clinical Anatomy*, Wolters Kluwer, 2019.
4. Frank H. Netter, *Atlas of Human Anatomy*, Elsevier, 2018.

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HUMAN PHYSIOLOGY-II

Code: 25ML202
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide an in-depth understanding of the physiological mechanisms of major organ systems, including cardiovascular, respiratory, renal, and gastrointestinal systems. It helps students correlate normal physiological functions with clinical parameters. The objective is to strengthen conceptual knowledge and practical skills essential for diagnostic and laboratory applications in healthcare.

UNIT I: Excretory System **(08 Hrs)**

- Functions of the kidneys, Composition of urine
- Mechanism of urine formation
- Regulations of body temperature
- Fluid and electrolyte balance
- Alterations in disease

UNIT II: Sensory Organs **(06 Hrs)**

- Functions of skin, eye, ear, nose, and tongue
- Alterations in disease

UNIT III: Endocrines **(08 Hrs)**

- Functions of pituitary, Pineal gland, Thymus, Thyroid, Parathyroid, Pancreas, Suprarenal & placenta
- Alterations in disease

UNIT IV: Reproduction **(12 Hrs)**

- Reproduction of cells-DNA, Mitosis, Meiosis, Spermatogenesis, Oogenesis
- Functions of female reproductive organs
- Functions of the breast, female sexual cycle
- Introduction to embryology
- Functions of male reproductive organs
- Fertility system
- Alterations in disease

UNIT V: Lymphatic and Immunological System **(06 Hrs)**

- Circulation of lymph
- Immunity
- Formations of T- Cells and B- Cells
- Types of Immune Response
- Antigens
- Cytokines

Text Books:

1. A.C. Guyton & J.E. Hall, *Textbook of Medical Physiology*, Elsevier, 2021.
2. Sujit K. Chaudhuri, *Concise Medical Physiology*, New Central Book Agency, Kolkata, 2018.
3. R.C. Guyton, *Basic Human Physiology*, CBS Publishers & Distributors, New Delhi, 2019.
4. Sarada Subrahmanyam, *Textbook of Physiology*, S. Chand Publishing, 2018

References:

1. John E. Hall, *Guyton and Hall Review of Medical Physiology*, Elsevier, 2020.
2. Linda S. Costanzo, *Physiology*, Elsevier, 2019.
3. William F. Ganong, *Review of Medical Physiology*, McGraw-Hill, 2017.
4. Arthur C. Guyton, *Human Physiology and Mechanisms of Disease*, Elsevier, 2019.

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LABORATORY APPARATUS, REAGENTS, AND CONCEPTS OF SI UNITS

Code: 25ML203
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to familiarize students with common laboratory apparatus, proper handling techniques, and preparation of reagents. It introduces the concepts of SI units, measurements, and standardization essential for laboratory accuracy. The objective is to develop practical skills for precise experimental work and safe laboratory practices.

UNIT I: Overview of the Functioning of Biochemistry Clinical Laboratory (08 Hrs)

- Introduction to glassware: Test tubes and serum tubes.
- Test tube draining rack, bottle racks, Pipette stands, tripod stand, wire gauze, and Bunsen burner.
- Cuvettes and their application in colorimetry and spectrophotometry.
- Bottle Dispensers and their Maintenance.
- Maintenance, Care, and cleaning of laboratory glassware.

UNIT II: Introduction to the Laboratory Instruments and Their Maintenance (10 Hrs)

- Use care and maintenance.
- Water Distillation Plant and Deionizers
- Refrigerators
- Centrifuges
- Laboratory Balance and Direct Readout Electrical Balances
- Colorimeter
- Spectrophotometer
- pH Meter and its Calibration

UNIT III: Conventional and SI Units Used in The Laboratory (12 Hrs)

- Molecular and equivalent weight
- Normality, molality, molarity
- Concentrations of solutions by w/w, w/v, v/v etc.
- Preparation of standard solutions
- Molar solutions and Percent solutions
- Acid, base, salts, and buffers Indicators and their Functions
- Buffers of the body

UNIT IV: Dilutions of Solutions or Samples (10 Hrs)

- Preparation of a stock standard and working standard.
- Proper method of dilution of a solution or a laboratory sample.
- Serial dilutions of samples
- Saturated and supersaturated solutions
- Significance of the volumetric flask in preparing standard solutions

Text Books:

1. K. Ramakrishna, *Practical Manual of Laboratory Techniques*, New Age International Publishers, 2018.
2. R.K. Sharma, *Laboratory Manual in Medical Laboratory Technology*, Jaypee Brothers Medical Publishers, 2017.
3. Vasudevan D.M., *Fundamentals of Laboratory Science*, S. Chand Publishing, 2019.
4. Dr. M. Lakshmi, *Laboratory Techniques and Instrumentation*, Elsevier, 2018.

References:

1. Jeanette J. Thurman & Kenneth R. Jennings, *Laboratory Manual for Clinical Chemistry and Microbiology*, McGraw-Hill, 2019.
2. Robert M. Brunton, *Practical Laboratory Techniques in Medical Laboratory Technology*, Elsevier, 2018.
3. R.C. Dubey, *Essentials of Laboratory Reagents and Techniques*, S. Chand Publishing, 2017.
4. K. P. Sinha, *Introduction to Laboratory Methods and SI Units*, Jaypee Brothers Medical Publishers, 2018.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

BASIC CONCEPTS OF IMMUNOLOGY AND SYSTEMIC BACTERIOLOGY

Code: 25ML204
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide foundational knowledge of the immune system, including innate and adaptive immunity, and their role in health and disease. It introduces systemic bacteriology, covering classification, structure, and pathogenicity of clinically important bacteria. The objective is to build a strong base for understanding host–pathogen interactions and laboratory diagnostic techniques.

UNIT I **(10 Hrs)**

- Concept of Immunity and its types.
- Antigen & Antibody
- Antigen antibody reactions I: Principle and types of Precipitation reaction and Agglutination reactions
- Antigen antibody reactions II: Complement fixation, Neutralization, ELISA, RIA, IF

UNIT II **(10 Hrs)**

- Systemic Bacteriology I: Morphology, culture characteristics, identification, diseases caused, and laboratory diagnosis of Staphylococcus, Streptococcus,
- Bacillus, Neisseria, Corynebacterium, Clostridium, Mycobacteria

UNIT III **(10 Hrs)**

- Systemic Bacteriology I: Morphology, culture characteristics, identification, diseases caused, and laboratory diagnosis of- Shigella, Salmonella, E. coli, Klebsiella, Proteus, Vibrio, Pseudomonas, Spirochetes

UNIT IV **(10 Hrs)**

- Morphology, culture characteristics, identification, diseases caused, and laboratory diagnosis of Mycoplasma, Nocardia, Actinomycetes, Legionella, Rickettsia
- Immuno-prophylaxis: Vaccines and their types.
- National immunization schedule (NIS) for infants, children, pregnant women, and healthcare workers.

Text Books:

1. K. S. Jawetz, Melnick & Adelberg, *Medical Microbiology*, McGraw-Hill, 2019.
2. Ananthanarayan R. & Paniker C.K.J., *Textbook of Microbiology*, Universities Press, 2017.
3. S. K. Bhatia, *Essentials of Immunology*, Jaypee Brothers Medical Publishers, 2018.
4. R.C. Dubey, *Textbook of Microbiology*, S. Chand Publishing, 2018.

References:

1. Ivan M. Roitt, *Essential Immunology*, Wiley-Blackwell, 2018.
2. Gerard J. Tortora, *Microbiology: An Introduction*, Pearson, 2019.
3. Richard A. Goldsby, Thomas J. Kindt & Barbara A. Osborne, *Kuby Immunology*, W.H. Freeman, 2018.
4. Talaro K.P. & Chess B., *Foundations in Microbiology*, McGraw-Hill, 2018.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

SYSTEMIC AND CLINICAL PATHOLOGY

Code: 25ML205
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide in-depth knowledge of disease processes affecting various organ systems and their clinical manifestations. It covers laboratory investigation techniques for diagnosing systemic disorders, including blood, urine, and tissue analysis. The objective is to equip students with the skills to correlate clinical findings with pathological changes for accurate laboratory diagnostics.

UNIT I: Clinical Pathology **(08 Hrs)**

- Routine urine examination—specimen, physical examination, chemical examination, microscopic examination, routine examination of CSF, semen analysis, routine examination of sputum, routine examination of body fluids- pleural, peritoneal, synovial

UNIT II **(08 Hrs)**

- Haemodynamic Disorders- Oedema, thrombosis, Embolism, Infarction, Shock, Hyperaemia & congestion, Haemorrhage.
- Neoplasm- Definition, Classification, Nomenclature and characteristics, Etiology & agents causing neoplasm, Biology of neoplastic growth & neoplasm immunology.

UNIT III **(14 Hrs)**

- Cardiovascular System- Myocardial Infraction, Atherosclerosis, Pericardial Heart Disease, Ischemic Heart Disease, response of Vascular Walls to injury, Venous Diseases.
- Respiratory system-Restrictive lung disease, pulmonary infection, pleural disorders-pneumothorax, pleural effusion, carcinomas
- Digestive System- Disease of Oesophagus – Congenital, Muscular, Inflammatory and Tumours, Salivary tumours
- Stomach - Peptic Ulcer, Gastritis, Neoplasm of Stomach, Intestine – Inflammatory - Ulcerative Colitis, Crohn's Disease, Infective – Enterocolitis, Colorectal cancer, Acute and Chronic Hepatitis, Cirrhosis of Liver, Hydronephrosis, Renal cell carcinoma
- Carcinoma of the Breast, Vaginitis, Endometrial Hyperplasia, Ovarian Tumours. Testicular Tumours,

UNIT IV **(10 Hrs)**

- Nervous system- Meningitis, Encephalitis, Cerebrovascular disease, Demyelinating Disease, Alzheimer's disease, Muscular Dystrophy, Disorder of the Neuromuscular Junction
- Skeletal System- Pyogenic Osteomyelitis, Tubercular Osteomyelitis, Tumours, Osteoporosis, Rickets, Osteoarthritis, Musculoskeletal system

Text Books:

1. Harsh Mohan, *Textbook of Pathology*, Jaypee Brothers Medical Publishers, 2019.
2. Robbins & Cotran, *Essentials of Pathology*, Elsevier, 2018.
3. Ramadas Nayak & Rakshitha Nayak, *Fundamentals of Pathology*, Jaypee Brothers Medical Publishers, 2017.
4. S.K. Sood, *Textbook of Medical Laboratory Technology (Pathology & Haematology)*, Jaypee Brothers Medical Publishers, 2018.

References:

1. Vinay Kumar, Abul Abbas & Jon Aster, *Robbins and Cotran Pathologic Basis of Disease*, Elsevier, 2020.
2. Barbara A. J. Bain, *Dacie and Lewis Practical Haematology*, Elsevier, 2019.
3. John Lukens, *Wintrobe's Clinical Hematology*, Wolters Kluwer, 2018.
4. R. Bhargava & I. Bhargava, *Practical Pathology and Haematology*, CBS Publishers & Distributors, 2017.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

HUMAN ANATOMY-II PRACTICAL

Code: 25ML291
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on experience in the identification and study of organ systems, including cardiovascular, respiratory, digestive, and urogenital systems. It helps students develop skills in specimen handling, dissection, and anatomical observations. The objective is to strengthen practical knowledge essential for clinical, diagnostic, and laboratory applications.

1. Identification and description of all anatomical structures.
2. Demonstration of dissected parts
3. Demonstration of skeleton-articulated and disarticulated.
4. Surface anatomy: Surface landmarks- bony, muscular, and ligamentous. Surface anatomy of major nerves and arteries of the limbs.

HUMAN PHYSIOLOGY-II PRACTICAL

Code: 25ML292
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide practical exposure to experiments related to cardiovascular, respiratory, renal, and gastrointestinal physiology. It enables students to develop skills in recording, analyzing, and interpreting physiological data. The objective is to reinforce theoretical knowledge and prepare students for clinical and diagnostic laboratory applications.

1. Haemoglobinometry
2. White Blood Cell count
3. Red Blood Cell count
4. Determination of Blood Groups
5. Leishman's staining and Differential WBC count
6. Determination of packed cell Volume
7. Erythrocyte sedimentation rate [ESR]
8. Calculation of Blood indices
9. Determination of Clotting Time, Bleeding Time
10. Blood pressure recording
11. Auscultation for Heart Sounds
12. Artificial Respiration

LABORATORY APPARATUS, REAGENTS, AND CONCEPTS OF SI UNITS PRACTICAL

Code: 25ML293
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on training in the proper use and maintenance of laboratory apparatus and the preparation of standard reagents. It familiarizes students with measurements, calculations, and applications of SI units in experiments. The objective is to develop precision, accuracy, and safety in routine laboratory practices.

1. Introduction to glassware and instruments
2. Preparation of %, molar and normal solutions
3. Understanding the principle of the pH meter and Demonstration of the pH meter

Colorimetry

1. Principle of colorimetry (Lambert and Beer's laws and their verification), colorimeter, and its uses
2. Standard curve, features, and uses

BASIC CONCEPTS OF IMMUNOLOGY AND SYSTEMIC BACTERIOLOGY PRACTICAL

Code: 25ML294
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on experience in basic immunological techniques, including antigen–antibody reactions and serological tests. It also trains students in isolation, staining, and identification of clinically important bacteria. The objective is to develop practical skills essential for understanding host–pathogen interactions and performing microbiological diagnostics.

1. Identification of bacterial culture
2. Colony characteristics
3. Morphological characteristics

Biomedical waste

1. Use of colour-coded bags: Black, Blue, Red, Yellow
2. Demonstration of Sterilization & Disinfection method
3. Autoclave
4. Hot Air oven
5. Water bath
6. Inspissator
7. Chemical Sterilization
8. Collection of specimens: From outpatient units, Inpatient units
9. Minor operation theatre
10. Major operation theatre for sterility testing
11. Disinfection of wards, OT and Laboratory
12. Visit to CSSD
13. Demonstration of personal protective equipment
14. Sterility testing Methods

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SYSTEMIC AND CLINICAL PATHOLOGY PRACTICAL

Code: 25ML295
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide practical training in laboratory techniques for the examination of blood, urine, and tissue specimens. It helps students identify pathological changes, perform routine diagnostic tests, and interpret clinical data. The objective is to strengthen hands-on skills necessary for accurate laboratory diagnosis and correlation with systemic diseases.

1. BT & CT determination
2. ABO/Rh blood grouping by slide methods- Forward & reverse grouping
3. Urine examination – complete (Physical & chemical examination for glucose, proteins, bile salts & ketone bodies).
4. Semen analysis – Physical, Chemical & Neubauer's chamber counting.

Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 mark each (1x10 = 10)
Answer any 10 out of 12 (Short 50-70 Words): 3 marks each (3x10 = 30)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 30 marks. The average of the two scores will be considered and scaled to 15 marks for the final assessment. Additionally, 5 marks will be awarded for assignments submitted, 5 for attendance, and 5 for general proficiency, for a total of 30 internal assessment marks.

Lab

Practical: 50 Marks
External: 30 Marks
Internal: 20 Marks

External Assessment: 30 Marks
Major Experiment: 12 marks
Minor Experiment: 08 marks
Viva: 05 marks
Practical record: 05 marks

Internal Assessment: 20 Marks
Experiment: 05 marks
Practical record: 05 marks
Attendance: 05 marks
Viva: 05 marks

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Syllabus for BMLT

Semester 3

Theory									
Course Code	**Topic**	**L**	**T**	**P**	**Credit**	**Theory Marks**	**Internal Marks**	**Practical Marks**	**Total Marks**
25ML301	Enzymology and Clinical Biochemistry-I	3	0	0	3	70	30	0	100
25ML302	Mycology and Parasitology	3	0	0	3	70	30	0	100
25ML303	Fundamentals of Histology, Cytology, and Hematology	3	0	0	3	70	30	0	100
25ML304	Medical Emergencies and Patient Care	3	0	0	3	70	30	0	100
25GN301	Environmental Studies	3	0	0	3	70	30	0	100
25ML391	Enzymology and Clinical Biochemistry-I Practical	2	0	0	2	0	20	30	50
25ML392	Mycology and Parasitology Practical	2	0	0	2	0	20	30	50
25ML393	Fundamentals of Histology, Cytology, and Hematology Practical	2	0	0	2	0	20	30	50
	Total				**21**	**350**	**210**	**90**	**650**

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Detailed Syllabus

ENZYMOLOGY AND CLINICAL BIOCHEMISTRY-I

Code: 25ML301
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide a detailed understanding of enzyme structure, kinetics, and regulation, along with their clinical significance. It introduces biochemical investigations used in diagnosing metabolic and systemic disorders. The objective is to equip students with theoretical and practical knowledge for analyzing biochemical parameters in clinical laboratory settings.

UNIT I: Structure, Functioning, and importance of enzymes in health and disease (06 Hrs)

- Introduction, definition, Classification, and mechanism of action of enzymes, Factors affecting enzyme activity, Clinical importance of enzymes and iso enzymes, Use of enzymes as reagents

UNIT II: Plasma Proteins (06 Hrs)

- Major classes of Plasma proteins, Synthesis of Plasma proteins, Function of Plasma Proteins, and Separation of Plasma proteins.

UNIT III: Integration of Metabolism and Metabolism in Starvation (10 Hrs)

- Definition and Significance of Integration of Metabolism, Integration of Metabolism at the Cellular and Tissue or Organ Level.
- Blood glucose regulation. Metabolism in Starvation, Phases of Starvation and Diabetes.

UNIT IV: Metabolic intermediates (12 Hrs)

- Introduction to Non-protein nitrogenous compounds, urea/BUN: Synthesis, clinico-pathological correlations and estimations, Creatin and creatinine: Synthesis, clinico-pathological correlations and estimations, Uric acid: Synthesis, clinico-pathological correlations and estimations, Ammonia, Porphyrins.

UNIT V: Mineral & Metabolic Bone Diseases (06 Hrs)

- Metabolism of Calcium, Phosphorus, Sulfur, etc.
- Metabolism of Trace elements.
- Bone metabolism, Markers of bone metabolism.

Text Books:

1. Satyanarayana U. & Chakrapani U., *Biochemistry*, Elsevier, 2020.
2. Vasudevan D.M., Sreekumari S. & Vaidyanathan K., *Textbook of Biochemistry for Medical Students*, Jaypee Brothers Medical Publishers, 2019.
3. Deb A.C., *Fundamentals of Biochemistry*, New Central Book Agency, Kolkata, 2018.
4. Jain J.L., Jain S. & Jain N., *Fundamentals of Biochemistry*, S. Chand Publishing, 2017.

References:

1. Lehninger, Nelson D.L. & Cox, M.M., *Lehninger Principles of Biochemistry*, W.H. Freeman, 2017.
2. Harper's Illustrated Biochemistry, Rodwell V., Bender D. et al., McGraw-Hill, 2018.
3. Voet D. & Voet J.G., *Biochemistry*, Wiley, 2018.
4. Berg J.M., Tymoczko J.L. & Gatto G.J., *Biochemistry*, W.H. Freeman, 2017.

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MYCOLOGY AND PARASITOLOGY

Code: 25ML302
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide foundational knowledge of medically important fungi and parasites, including their morphology, life cycles, and pathogenic mechanisms. It enables students to understand host–parasite interactions and common fungal and parasitic diseases. The objective is to prepare students for laboratory identification, diagnosis, and prevention of mycological and parasitological infections.

UNIT I **(08 Hrs)**

- Mycology: Morphology and Classification of Fungi.
- Lab diagnosis of fungal Infections: staining, culture media, and conventional mycological techniques

UNIT II **(12 Hrs)**

- Superficial Mycoses: Dermatophytes, Malassezia
- Subcutaneous Mycoses: Mycetoma, Rhinosporidium, and Sporotrichosis
- Systemic Mycoses: Histoplasmosis, Blastomycosis, Cryptococcosis
- Opportunistic Fungi: Aspergillosis, Pencillosis, Zygomycosis, Candidiasis, Pneumocystis

UNIT III **(10 Hrs)**

- Parasitology I: Classification and morphology of Protozoa
- Structure, life cycle pathogenesis & laboratory diagnosis of-Entamoeba, Trichomonas and Giardia, Plasmodium, Leishmania, Toxoplasma, Cryptosporidium & coccidian parasites

UNIT IV **(10 Hrs)**

- Parasitology II: Classification and morphology of Helminthes- Taenia, Echinococcus, Ascaris, Ancylostoma, Strongyloides, Trichuris, &Enterobius, Filaria

Text Books:

1. K.D. Chatterjee, *Parasitology (Protozoology and Helminthology)*, 14th Edition, CBS Publishers, 2019.
2. Ray, C.G. & Ryan, K.J., *Sherris Medical Microbiology*, 7th Edition, McGraw-Hill, 2022.
3. Kokare, C.R., *Pharmaceutical Microbiology*, 5th Edition, Nirali Prakashan, 2021.
4. Arvind Kumar & C.P. Baveja, *Textbook of Microbiology*, Arya Publishing, 2022.
5. Talaro, K. & Chess, B., *Foundations in Microbiology*, 12th Edition, McGraw-Hill, 2021.

References:

1. Koneman, E.W. et al., *Koneman's Color Atlas and Textbook of Diagnostic Microbiology*, 8th Edition, Lippincott Williams & Wilkins, 2021.
2. Murray, P.R., Rosenthal, K.S. & Pfaller, M.A., *Medical Microbiology*, 10th Edition, Elsevier, 2023.
3. Brooks, G.F., Carroll, K.C., & Butel, J.S., *Jawetz, Melnick & Adelberg's Medical Microbiology*, 28th Edition, McGraw-Hill, 2024.
4. David H. Ellis et al., *Medical Mycology: A Self-Instructional Text*, 5th Edition, Garland Science, 2017.
5. Markell, E.K., Voge, M., & John, D.T., *Markell and Voge's Medical Parasitology*, 10th Edition, Elsevier, 2020.

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FUNDAMENTALS OF HISTOLOGY, CYTOLOGY, AND HEMATOLOGY

Code: 25ML303
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to introduce students to the microscopic structure of tissues, principles of cytological examination, and fundamentals of blood cell morphology. It helps learners understand normal and abnormal cellular patterns essential for disease diagnosis. The objective is to develop foundational knowledge and skills required for histological processing, cytological screening, and basic hematological investigations.

UNIT I: Fundamentals of Applied Histology **(08 Hrs)**

- Microscopy – working principle, maintenance, and applications, & various types of microscopes.
- Dark ground microscope, Polarizing microscope, Phase contrast microscope, interference microscope, U.V light microscope.
- H&E Stain & its importance.
- Connective tissue stain, trichrome staining, and other special stains.
- Principle of metal impregnation techniques.
- Principles of immunohistochemistry and its techniques.

UNIT II: Cytology **(12 Hrs)**

- Stains cytological preparation with special emphasis on MGG, Papanicolour Stains.
- Special stains like PAS, Mucicarmine, and Alcian blue.
- Cytological screening and quality control in the cytology laboratory.

UNIT III: Haematology **(10 Hrs)**

- Haematopoiesis & stem cells.
- Anaemias: - Types, classification, definition & microcytic hypochromic & macrocytic anaemia
- Bone marrow aspiration composition and function
- Staining of bone marrow smears and preparation of histological sections

UNIT IV **(10 Hrs)**

- Haemoglobin: Its synthesis, functions, and degradation
- Haemoglobin pigments and their measurement
- Abnormal haemoglobins and their means of identification & estimation
- LE Cell phenomenon, and various methods of its demonstration.
- Coagulation factors.
- Haemostatic mechanism and theories of blood coagulation & Haemophilia
- Preparation of packed cells and various fractions of blood for transfusion purposes

Text Books:

1. Junqueira, L.C. & Carneiro, J., *Junqueira's Basic Histology: Text and Atlas*, 16th Edition, McGraw-Hill, 2021.
2. K. Sembulingam & Prema Sembulingam, *Essentials of Medical Physiology* (Histology sections), Jaypee Brothers, 2021.
3. C.P. Baveja & Arvind Kumar, *Textbook of Microbiology* (Cytology basics included), Arya Publishing, 2022.
4. Indu Khurana, *Textbook of Medical Physiology* (Blood/Hematology section), Elsevier, 2021.
5. A.K. Datta, *Essentials of Hematology*, 1st Edition, 2014, Jaypee Brothers.

References:

1. Gartner, L.P. & Hiatt, J.L., *Color Textbook of Histology*, 4th Edition, Elsevier, 2018.
2. Young, B., O'Dowd, G. & Woodford, P., *Wheater's Functional Histology: A Text and Colour Atlas*, 7th Edition, Elsevier, 2021.
3. Hoffbrand, A.V. & Moss, P., *Essential Haematology*, 7th Edition, Wiley-Blackwell, 2016.
4. Ghosh, S., *Textbook of Histology*, Jaypee Brothers, 2017.
5. Hoffbrand, A.V. et al., *Hoffbrand's Essential Haematology*, 8th Edition, Wiley-Blackwell, 2021.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

MEDICAL EMERGENCIES AND PATIENT CARE

Code: 25ML304
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide students with essential knowledge of common medical emergencies and the principles of immediate patient care. It helps learners understand basic life support, first aid, and safe patient handling techniques. The objective is to prepare students to respond effectively in emergencies and support clinical teams in ensuring patient safety and comfort.

UNIT I: Introduction to Emergency Services (10 Hrs)

- Organization of Emergency Department, Guidelines in Emergency, Clinical Monitoring, Fluid Therapy and Blood Transfusion, Airway Management, Cardiopulmonary Resuscitation, Principles of Mechanical Ventilation, Injection – An Infusion Method, Acid Base and Electrolyte Imbalance

UNIT II: Handling of Different Emergencies (10 Hrs)

- Cardiogenic Shock, Congestive Cardiac Failure, Myocardial Infarction, Head Injuries, Vasovagal Syncope, Seizure, Epilepsy, Conjunctival and Corneal Foreign Body, Foreign Body in Nose & in Ear, Epistaxis, Asthma, COPD, Haemoptysis, Rib Fracture, Tear Gas Exposure, Food Poisoning, Diarrhea, Urine Retention, Blunt Scrotal Trauma, Hypo & Hyperthermia

UNIT III: Fundamentals of Patient Care (10 Hrs)

- Concept of health & Illness, Health Determinants, Concept of Patients & Their Types, Patient Centred Care & Fundamentals of Communications, Reporting & Recording of Patients, Rights of Patients, Concepts of Disease & Its Types, General Concept, Care & Prevention of Accident, Trauma & Infections

UNIT IV: Patient Care, Associated Units & Departments (10 Hrs)

- Ambulatory Units, Critical Care Units, Paediatric, Neonatal Intensive Care Unit (NICU), Emergency Department, Inpatient Units, Haematology/Oncology and Immunology Unit, Orthopaedic Unit, Psychiatry Unit, Neurology and Neurosurgical Unit, Renal, Dialysis Unit, Gastroenterology/Endocrinology Unit, Life Flight Critical Care Transport Program, Radiology Department, Surgical Units, Cardiac Catheterization Lab, Operating Room, Post Anaesthesia Care Unit, Managing patients with disabilities, Geriatric Care, Care of Critically Ill Patients, Tracheotomise Patients. Nutritional Support in ICU

Text Books:

1. Sharma, R.K. & Sharma, S., *Textbook of Emergency Medicine*, Jaypee Brothers Medical Publishers, 2019.
2. Goldfrank, L.R. et al., *Goldfrank's Toxicologic Emergencies*, 11th Edition, McGraw-Hill, 2019.
3. Tintinalli, J.E. et al., *Tintinalli's Emergency Medicine: A Comprehensive Study Guide*, 9th Edition, McGraw-Hill, 2020.
4. Linda S. Williams & Paula D. Hopper, *Understanding Medical Surgical Nursing* (Emergency care sections), F.A. Davis, 2019.

References:

1. American Academy of Orthopaedic Surgeons (AAOS), *Emergency Care and Transportation of the Sick and Injured*, 12th Edition, Jones & Bartlett Learning, 2021.
2. Marx, J.A. et al., *Rosen's Emergency Medicine: Concepts and Clinical Practice*, 9th Edition, Elsevier, 2018.
3. LeMone, P., Burke, K. & Bauldoff, G., *Medical-Surgical Nursing: Critical Thinking for Collaborative Care*, Elsevier, 2019 (Patient care chapters).
4. Caroline, N. et al., *Nancy Caroline's Emergency Care in the Streets*, 9th Edition, Jones & Bartlett Learning, 2022.

ARYAVART INTERNATIONAL UNIVERSITY
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ENVIRONMENTAL STUDIES

Code: 25GN301
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course will empower the students by gaining in-depth knowledge on natural processes that sustain life and govern economy, predicting the consequences of human actions on the web of life, global economy and quality of human life, developing critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development, acquiring values and attitudes towards understanding complex environmental economic-social challenges, and participating actively in solving current environmental problems and preventing the future ones and adopting sustainability as a practice in life, society and industry.

UNIT I: Introduction to Environmental Studies (08 Hrs)

- Environmental studies: Nature, Scope and Importance; Components of environment: atmosphere, hydrosphere, lithosphere, and biosphere; Concept of sustainability and sustainable development.
- Emergence of environmental issues: Climate change, Global warming, Ozone layer depletion, Acid rain, etc.; International agreements and programs: Earth Summit, UNFCCC, Montreal and Kyoto protocols, Convention on Biological Diversity (CBD), Ramsar Convention, UNEP, CITES, etc.

UNIT II: Ecosystems and Natural Resources (09 Hrs)

- Definition and concept of Ecosystem; Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession), ecological pyramids and homeostasis; Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India.
- Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration.
- Energy resources: Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source.

UNIT III: Biodiversity and Conservation (09 Hrs)

- Definition of Biodiversity; Levels of biological diversity: genetic, species and ecosystem diversity.
- India as a mega-biodiversity nation; Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered species of India; IUCN Red list criteria and categories.
- Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and informational values of biodiversity with examples.
- Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis.
- Biodiversity conservation strategies: in-situ and ex-situ methods of conservation (National Parks, Wildlife Sanctuaries, and Biosphere reserves.

UNIT IV: Environmental Pollution and Control Measures (08 Hrs)

- Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards.
- Nuclear hazards and human health risks.
- Solid waste management: Control measures for various types of urban, industrial waste, Hazardous waste, E-waste, etc.; Waste segregation and disposal.

Text Book:

1. Sanjay Kumar Batra, Kanchan Batra, Harpreet Kaur; "Environmental Studies"; Taxmann's, Fifth Edition.
2. M. M. Sulphey; "Introduction to Environment Management"; PHI Learning, 2019.

3. S. P. Mishra, S. N. Pandey; "Essential Environmental Studies"; Ane Books Pvt. Ltd.; Sixth Edition.

Reference Books:

1. Asthana, D. K. (2006). "Text Book of Environmental Studies". S. Chand Publishing.
2. Basu, M., Xavier, S. (2016). "Fundamentals of Environmental Studies", Cambridge University Press, India.
3. Bharucha, E. (2013). "Textbook of Environmental Studies for Undergraduate Courses". University Press.
4. Mahapatra, R., Jeevan, S. S., Das, S. (Eds) (2017). "Environment Reader for Universities", Centre for Science and Environment, New Delhi.
5. Masters, G. M. & Ela, W. P. (1991). "Introduction to environmental engineering and science". Englewood Cliffs, NJ: Prentice Hall.
6. Odum, E. P., Odum, H. T. & Andrews, J. (1971). "Fundamentals of Ecology". Philadelphia: Saunders.
7. Sharma, P. D. & Sharma, P. D. (2005). "Ecology and Environment". Rastogi Publications.

ENZYMOLOGY AND CLINICAL BIOCHEMISTRY-I PRACTICAL

Code: 25ML391
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on training in the estimation of enzymes and key biochemical parameters used in clinical diagnosis. It enables students to develop skills in sample handling, reagent preparation, and accurate biochemical analysis. The objective is to strengthen practical competence in performing routine enzymatic and clinical biochemistry tests essential for diagnostic laboratories.

1. Auto pipettes
2. Working and calibration of auto pipettes of different types
3. Estimation on semi-automated Biochemistry analysers
4. Standardization and calibration of semi-automated Biochemistry Analysers
5. Estimation of various biochemical parameters by using semi-automated biochemistry analysers: Lipid Profile, Glucose, Calcium, and Phosphorus
6. Blood collection and Separation of serum and plasma.
7. Estimation of glucose by the GOD POD method.
8. Estimation of urea by the Urease (Berthelot) test.
9. Estimation of uric acid by the Uricase/PAP method.
10. Urine analysis
11. Analysis of urine for abnormal constituents

MYCOLOGY AND PARASITOLOGY PRACTICAL

Code: 25ML392
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide practical training in the identification of fungi and parasites through microscopy, staining, and culture techniques. It helps students learn specimen collection, processing, and diagnostic interpretation. The objective is to build essential laboratory skills required for accurate detection and diagnosis of mycological and parasitological infections.

Mycology

1. Demonstration of fungi using KOH, Lactophenol, cotton blue, and India ink
2. Colony characteristics microscopic examination, and identification tests for:
3. Candida and Cryptococcus,

4. Dermatophytes
5. Aspergillus sp
6. Miscellaneous fungi
7. Slide culture technique

Parasitology

1. Stool examination: Saline mount, Iodine mount
2. Stool concentration techniques
3. Preparation of thick and thin smears
4. Preparation and staining technique of Leishman's stain and Giemsa stain
5. Demonstration of the malarial parasite in the peripheral smear
6. Rapid test for malaria and QBC

FUNDAMENTALS OF HISTOLOGY, CYTOLOGY, AND HEMATOLOGY PRACTICAL

Code: 25ML393
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to train students in basic histological techniques, including tissue processing, sectioning, and staining. It provides hands-on experience in cytological sample preparation and microscopic examination of cells. The objective is to develop practical skills in blood smear preparation, staining, and interpretation of haematological findings essential for diagnostic laboratory work.

1. Coomb's test direct & indirect.
2. Urine – Microscopic examination.
3. Reticulocytes, count - preparation, staining & corrected retic count.
4. Semen analysis- physical and chemical & microscopy with Methylene blue staining for morphology.
5. Body fluid analysis (CSF, Pleural, Peritoneal/ascetic fluid)- Physical, Chemical, M/E.

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Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 mark each (1x10 = 10)
Answer any 10 out of 12 (Short 50-70 Words): 3 marks each (3x10 = 30)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 30 marks. The average of the two scores will be considered and scaled to 15 marks for the final assessment. Additionally, 5 marks will be awarded for assignments submitted, 5 for attendance, and 5 for general proficiency, for a total of 30 internal assessment marks.

Lab

Practical: 50 Marks
External: 30 Marks
Internal: 20 Marks

External Assessment: 30 Marks
Major Experiment: 12 marks
Minor Experiment: 08 marks
Viva: 05 marks
Practical record: 05 marks

Internal Assessment: 20 Marks
Experiment: 05 marks
Practical record: 05 marks
Attendance: 05 marks
Viva: 05 marks

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Syllabus for BMLT

Semester 4

Theory									
Course Code	**Topic**	**L**	**T**	**P**	**Credit**	**Theory Marks**	**Internal Marks**	**Practical Marks**	**Total Marks**
25ML401	Enzymology and Clinical Biochemistry-II	3	0	0	3	70	30	0	100
25ML402	Virology, Specimen Handling and Applied Microbiology	3	0	0	3	70	30	0	100
25ML403	General Pathology and Transfusion Medicine	3	0	0	3	70	30	0	100
25GN101	Communication Skills and Personality Development	3	0	0	3	70	30	0	100
25GN201	Fundamentals of Information Technology	3	0	0	3	70	30	0	100
25ML491	Enzymology and Clinical Biochemistry-II Practical	2	0	0	2	0	20	30	50
25ML492	Virology, Specimen Handling and Applied Microbiology	2	0	0	2	0	20	30	50
25ML493	General Pathology and Transfusion Medicine Practical	2	0	0	2	0	20	30	50
	Total				**21**	**350**	**210**	**90**	**650**

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Detailed Syllabus

ENZYMOLOGY AND CLINICAL BIOCHEMISTRY-II

Code: 25ML401
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide an advanced understanding of enzyme regulation, isoenzymes, and their clinical correlations in disease diagnosis. It covers biochemical parameters related to liver, kidney, cardiac, and endocrine functions. The objective is to equip students with greater analytical skills for interpreting clinical biochemistry results and supporting accurate diagnostic decision-making.

UNIT I: Clinical Enzymology & Biomarkers (10 Hrs)

- Clinical enzymology, plasma lipid profile, hypolipoproteinemias, hyperlipidemias.
- Cardiac markers-creatine kinase (CK-MB), cardiac troponins, highly sensitive TnT, AST & LDH.
- Markers of Muscle diseases-creatine kinase (CK-MM), aldolase.
- Markers of bone disease- Alkaline phosphatase, heat-labile bone isoenzymes.
- Prostate markers- prostate-specific antigen, acid phosphatase.
- Miscellaneous enzymes-Glucose-6-phosphate dehydrogenase, urease, glucose oxidase & peroxidase.

UNIT II: Diseases and Organ Function Tests (08 Hrs)

- Kidney function tests, Liver function tests, Thyroid function tests, Pancreatic function tests, Diabetes Mellitus, Porphyrias, Jaundice, Atherosclerosis, Myocardial infarction, Nephrotic and Nephritic Syndrome

UNIT III: Specimen Collection & Reports Release (10 Hrs)

- Types of Specimens, Method of specimen collection (Blood, serum, Urine and others), Separating the serum and plasma, Use of preservatives in specimen collection, Use of proper Anticoagulants in specimen collection, Analyzing and releasing final Biochemistry reports, Precautions required before release of reports

UNIT IV: Acid-Base balance & pH (12 Hrs)

- Buffers of body fluids, respiratory regulation of pH, renal regulation of pH, disturbances in acid-base balance- metabolic acidosis, metabolic alkalosis.
- Respiratory acidosis & alkalosis, anion gap, determination of blood pH & gases.

Text Books:

1. Satyanarayana U. & Chakrapani U., *Biochemistry*, Elsevier, 2020.
2. Vasudevan D.M., Sreekumari S. & Vaidyanathan K., *Textbook of Biochemistry for Medical Students*, Jaypee Brothers Medical Publishers, 2019.
3. Deb A.C., *Fundamentals of Biochemistry*, New Central Book Agency, Kolkata, 2018.
4. Jain J.L., Jain S. & Jain N., *Fundamentals of Biochemistry*, S. Chand Publishing, 2017.

References:

1. Lehninger, Nelson D.L. & Cox M.M., *Lehninger Principles of Biochemistry*, W.H. Freeman, 2017.
2. Harper's Illustrated Biochemistry, Rodwell V., Bender D. et al., McGraw Hill, 2018.
3. Voet D. & Voet J.G., *Biochemistry*, Wiley, 2018.
4. Berg J.M., Tymoczko J.L. & Gatto G.J., *Biochemistry*, W.H. Freeman, 2017.

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VIROLOGY, SPECIMEN HANDLING, AND APPLIED MICROBIOLOGY

Code: 25ML402
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide foundational knowledge of medically important viruses, their structure, replication, and pathogenicity. It emphasizes proper specimen collection, handling, and processing for accurate laboratory diagnosis. The objective is to develop practical skills in virological techniques and apply microbiological principles in clinical and public health laboratories.

UNIT I **(10 Hrs)**

- Virology I: General properties of Viruses, Collection, transportation, and storage of samples for viral diagnosis, Cultivation of viruses.
- Morphology, replication, clinical features, and laboratory diagnosis of Bacteriophages, Herpes viruses, Viral Hepatitis, Human Immunodeficiency Viruses, Rabies

UNIT II **(10 Hrs)**

- Virology-II Morphology, replication, clinical features, and laboratory diagnosis of: Poliomyelitis, Influenza Viruses, Rubella, Mumps, Measles, Rota virus, Japanese encephalitis & Dengue Chikungunya, Kyasanur Forest disease, Human Oncogenic Viruses.

UNIT III **(08 Hrs)**

- Specimen processing -Blood, Sputum, throat swab, nasopharyngeal swab, Swabs (pus, wound), CSF and other body fluids, Stool and rectal swabs.

UNIT IV **(12 Hrs)**

- Applied Microbiology-Hospital infection control, Healthcare-associated infections
- Emerging infectious diseases, Zoonosis. Bacteriology of Water, Milk, and Air

Text Books:

1. Ray, C.G. & Ryan, K.J., *Sherris Medical Microbiology*, 7th Edition, McGraw-Hill, 2022.
2. Ananthanarayan R. & Paniker C.K.J., *Textbook of Microbiology*, Universities Press, 2017.
3. K.D. Chatterjee, *Parasitology and Virology*, CBS Publishers, 2019.
4. Talaro K.P. & Chess B., *Foundations in Microbiology*, 12th Edition, McGraw-Hill, 2021.

References:

1. Koneman, E.W. et al., *Koneman's Color Atlas and Textbook of Diagnostic Microbiology*, 8th Edition, Lippincott Williams & Wilkins, 2021.
2. Murray, P.R., Rosenthal, K.S. & Pfaller, M.A., *Medical Microbiology*, 10th Edition, Elsevier, 2023.
3. Brooks, G.F., Carroll, K.C., & Butel, J.S., *Jawetz, Melnick & Adelberg's Medical Microbiology*, 28th Edition, McGraw-Hill, 2024.
4. David H. Ellis et al., *Medical Virology: A Self-Instructional Text*, 5th Edition, Garland Science, 2017.

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GENERAL PATHOLOGY AND TRANSFUSION MEDICINE

Code: 25ML403
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide comprehensive knowledge of disease mechanisms, including cellular injury, inflammation, and tissue responses. It introduces principles of transfusion medicine, including blood grouping, cross-matching, and safe blood transfusion practices. The objective is to equip students with theoretical and practical skills for accurate laboratory diagnosis and effective clinical support in pathology and transfusion services.

UNIT I: General Pathology **(08 Hrs)**

- Inflammation:- Definition, causes, types & various cells of inflammation.
- Immunity:- Definition, types of antigens & various types of antibodies.
- Hypersensitivity:- Definition with types & examples.

UNIT II **(08 Hrs)**

- Neoplasia:- Definition, classification, difference between benign & malignant tumors in brief, various modes of invasion and diagnosis in brief.
- Infections:- Malaria, tuberculosis, dengue & AIDS in brief.
- Nutritional diseases:- Fat & water soluble vitamins, Rickets, Scurvy.

UNIT III: Fundamentals of Transfusion Medicine **(12 Hrs)**

- Compatibility of tests in blood transfusion.
- Complications and hazards of blood transfusion
- Blood groups:- Types & Bombay blood group
- Blood donor selection.
- Methods of bleeding donors.
- Blood containers, anticoagulants, and storage of blood.
- Coomb's test and its significance.
- Screening of blood for infectious material
- Blood components, preparation & component therapy.
- Transfusion reactions and workup
- Blood bank organization, standards, procedures, techniques, and quality control.

UNIT IV **(12 Hrs)**

- Coomb's test and its significance.
- Screening of blood for infectious material
- Blood components, preparation & component therapy.
- Transfusion reactions and workup
- Blood bank organization, standards, procedures, techniques, and quality control.
- Laboratory investigation of transfusion reactions and mismatched transfusion.
- Various component of blood:- Separation & its uses.

Text Books:

1. Harsh Mohan, *Textbook of Pathology*, Jaypee Brothers Medical Publishers, 2019.
2. Robbins & Cotran, *Essentials of Pathology*, Elsevier, 2018.
3. Ramadas Nayak & Rakshitha Nayak, *Fundamentals of Pathology*, Jaypee Brothers Medical Publishers, 2017.
4. S.K. Sood, *Textbook of Medical Laboratory Technology (Pathology & Haematology)*, Jaypee Brothers Medical Publishers, 2018.

References:

1. Vinay Kumar, Abul Abbas & Jon Aster, *Robbins and Cotran Pathologic Basis of Disease*, Elsevier, 2020.
2. Barbara A.J. Bain, *Dacie and Lewis Practical Haematology*, Elsevier, 2019.

3. John Lukens, *Wintrobe's Clinical Hematology*, Wolters Kluwer, 2018.
4. R. Bhargava & I. Bhargava, *Practical Pathology and Haematology*, CBS Publishers & Distributors, 2017.
5. M. Schmidt, *Transfusion Medicine: Apheresis, Blood Components, and Safety*, Springer, 2019.

COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Code: 25GN101
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to enhance students' verbal, non-verbal, and written communication abilities essential for academic and professional settings. It focuses on building confidence, interpersonal skills, and a positive personality. The objective is to prepare students for effective interaction, teamwork, and professional conduct in healthcare and laboratory environments.

UNIT I: Listening Comprehension **(08 Hrs)**

- Speeches
- Interviews
- audio-video clippings followed by exercises
- Introduction to Communication
- Importance of Communication
- Barriers to Communication and ways to overcome them

UNIT II: Conversation Skills **(08 Hrs)**

- Greetings and introducing oneself
- Framing questions and answers
- Role play
- Buying: asking details, etc
- Word formation strategies
- Vocabulary building: Antonyms, Synonyms, Affixation, Suffixation, One-word substitution

UNIT III: Reading Comprehension **(08 Hrs)**

- Simple narration and Stories
- Simple Passages
- Newspaper and articles clippings
- Note Making
- Paragraph Writing
- Comprehension
- Report Writing: types, characteristics
- Introduction to Letter Writing

UNIT IV: Pronunciation **(08 Hrs)**

- Pronunciation
- Syllable and Stress
- Intonation and Modulation

UNIT V: Writing Comprehension **(08 Hrs)**

- Letters: types, format, style
- Précis Writing
- Paragraph: Order, Topic sentence, consistency, coherence
- Report and Proposal
- Project Writing: Features, Structure

Text Books:

1. Meenakshi Raman & Sangeeta Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, 2018.
2. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, 2019.
3. Leena Sen, *Communication Skills*, PHI Learning, 2017.
4. Barun K. Mitra, *Personality Development and Soft Skills*, Oxford University Press, 2018.

References:

1. Stephen R. Covey, *The 7 Habits of Highly Effective People*, Simon & Schuster, 2020.
2. Dale Carnegie, *How to Win Friends and Influence People*, Simon & Schuster, 2019.
3. Wallace & Masters, *Personal Development for Life and Work*, Cengage Learning, 2017.
4. Hurlock Elizabeth, *Personality Development*, Tata McGraw-Hill, 2018.

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Code: 25GN201
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to enhance students' verbal, non-verbal, and written communication abilities essential for academic and professional settings. It focuses on building confidence, interpersonal skills, and a positive personality. The objective is to prepare students for effective interaction, teamwork, and professional conduct in healthcare and laboratory environments.

UNIT I: Listening Comprehension **(08 Hrs)**

- Speeches
- Interviews
- audio-video clippings followed by exercises
- Introduction to Communication
- Importance of Communication
- Barriers to Communication and ways to overcome them

UNIT II: Conversation Skills **(08 Hrs)**

- Greetings and introducing oneself
- Framing questions and answers
- Role play
- Buying: asking details, etc
- Word formation strategies
- Vocabulary building: Antonyms, Synonyms, Affixation, Suffixation, One-word substitution

UNIT III: Reading Comprehension **(08 Hrs)**

- Simple narration and Stories
- Simple Passages
- Newspaper and articles clippings
- Note Making
- Paragraph Writing
- Comprehension
- Report Writing: types, characteristics
- Introduction to Letter Writing

UNIT IV: Pronunciation **(08 Hrs)**

- Pronunciation
- Syllable and Stress
- Intonation and Modulation

UNIT V: Writing Comprehension **(08 Hrs)**

- Letters: types, format, style
- Précis Writing
- Paragraph: Order, Topic sentence, consistency, coherence
- Report and Proposal
- Project Writing: Features, Structure

Text Books:

1. Meenakshi Raman & Sangeeta Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, 2018.
2. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, 2019.
3. Leena Sen, *Communication Skills*, PHI Learning, 2017.
4. Barun K. Mitra, *Personality Development and Soft Skills*, Oxford University Press, 2018.

References:

1. Stephen R. Covey, *The 7 Habits of Highly Effective People*, Simon & Schuster, 2020.
2. Dale Carnegie, *How to Win Friends and Influence People*, Simon & Schuster, 2019.
3. Wallace & Masters, *Personal Development for Life and Work*, Cengage Learning, 2017.
4. Hurlock Elizabeth, *Personality Development*, Tata McGraw-Hill, 2018.

ENZYMOLOGY AND CLINICAL BIOCHEMISTRY-II PRACTICAL

Code: 25ML491
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on training in advanced enzyme assays and clinical biochemical tests for liver, kidney, cardiac, and endocrine functions. It enables students to develop precision in sample handling, reagent preparation, and result interpretation. The objective is to enhance practical competence in clinical biochemistry for accurate diagnostic laboratory applications.

1. Estimation on semi-automated Biochemistry analyzers
2. Standardization and calibration of semi-automated Biochemistry Analyzers
3. Estimation of various biochemical parameters, like using semi-automated biochemistry analyzers –LFT, KFT
4. Cardiac markers (CK-MB and CK total)
5. GTT and GTC
6. 24-hour urinary creatinine, calcium, and proteins
7. Blood Gas Analysis
8. Standardization and calibration of the Blood Gas Analyzer
9. Blood-Gas Analysis and reporting
10. Quality control: Various quality control measures used in the laboratory, and how to maintain the quality

VIROLOGY, SPECIMEN HANDLING AND APPLIED MICROBIOLOGY PRACTICAL

Code: 25ML492
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide practical training in virus detection, culture techniques, and microscopic examination. It emphasizes proper collection, transport, and handling of clinical specimens to ensure accurate results. The objective is to develop essential laboratory skills for virological diagnosis and applied microbiological investigations in clinical and public health settings.

1. Spot tests/ELISA: HBV, HCV, HIV, Dengue X2
2. Demonstration of embryonated egg inoculation
3. Demonstration of cell culture techniques and Cytopathic effect
4. Demonstration of hemagglutination and hemagglutination inhibition assay

GENERAL PATHOLOGY AND TRANSFUSION MEDICINE PRACTICAL

Code: 25ML493
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on experience in laboratory techniques for examining pathological specimens and understanding disease processes. It includes practical training in blood grouping, crossmatching, and safe transfusion practices. The objective is to develop essential skills for accurate laboratory diagnosis and effective support in pathology and transfusion services.

1. Sickling test for sickle cell anemia.
2. Osmotic fragility test.
3. LE Cell preparation & estimation.
4. PT & APTT Test.
5. BT & CT Test with clot retraction time.

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Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 mark each (1x10 = 10)
Answer any 10 out of 12 (Short 50-70 Words): 3 marks each (3x10 = 30)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 30 marks. The average of the two scores will be considered and scaled to 15 marks for the final assessment. Additionally, 5 marks will be awarded for assignments submitted, 5 for attendance, and 5 for general proficiency, for a total of 30 internal assessment marks.

Lab

Practical: 50 Marks
External: 30 Marks
Internal: 20 Marks

External Assessment: 30 Marks
Major Experiment: 12 marks
Minor Experiment: 08 marks
Viva: 05 marks
Practical record: 05 marks

Internal Assessment: 20 Marks
Experiment: 05 marks
Practical record: 05 marks
Attendance: 05 marks
Viva: 05 marks

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Syllabus for BMLT

Semester 5

Theory									
Course Code	**Topic**	**L**	**T**	**P**	**Credit**	**Theory Marks**	**Internal Marks**	**Practical Marks**	**Total Marks**
25ML501	Diagnostic Endocrinology	3	0	0	3	70	30	0	100
25ML502	Immunology and Applied Microbiology	3	0	0	3	70	30	0	100
25ML503	Applied Histology, Cytology, and Cytogenetics	3	0	0	3	70	30	0	100
25ML504	Research Methodology and Biostatistics	3	0	0	3	70	30	0	100
25ML505	Hospital Management and Medical Ethics	3	0	0	3	70	30	0	100
25ML591	Diagnostic Endocrinology Practical	2	0	0	2	0	20	30	50
25ML592	Immunology and Applied Microbiology Practical	2	0	0	2	0	20	30	50
25ML593	Applied Histology, Cytology, and Cytogenetics Practical	2	0	0	2	0	20	30	50
	Total				**21**	**350**	**210**	**90**	**650**

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Detailed Syllabus

DIAGNOSTIC ENDOCRINOLOGY

Code: 25ML501
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide comprehensive knowledge of the endocrine system, hormone functions, and related disorders. It emphasizes the principles and methods of hormonal assays and laboratory diagnosis of endocrine diseases. The objective is to equip students with the theoretical understanding and practical skills necessary for accurate endocrine diagnostics in clinical laboratories.

UNIT I **(06 Hrs)**

- Introduction and classification of hormones, difference between hormones and enzymes, Regulation and general mechanism of action of hormones. Diagnostic endocrinology techniques- ELISA, RIA, chemiluminescence assay

UNIT II **(10 Hrs)**

- Pituitary gland & hypothalamus, hormones of the Anterior Pituitary- Growth hormone, Prolactin, Gonadotropin, Follicle Stimulating hormone, Luteinizing Hormone, Thyroid-stimulating hormone (TSH), Adrenocorticotropic hormone (ACTH)

UNIT III **(08 Hrs)**

- Thyroid hormones – T3, T4, PTH, disorders. Neurohypophysis hormones-Oxytocin, Antidiuretic hormone.

UNIT IV **(16 Hrs)**

- Kidney, pancreatic, and Gonads hormones -Renin, Adrenal gland hormones-Aldosterone, Glucocorticoids, Mineralocorticoids, cortisol, and disorders associated with them di. Insulin, glucagon, somatostatin, and disorders associated with them. Testosterone, Estrogens, Progesterone, Human Chorionic Gonadotropin (HCG), and disorders associated with them.

Text Books:

1. Guyton, A.C. & Hall, J.E., *Textbook of Medical Physiology* (Endocrinology sections), Elsevier, 2021.
2. U. Satyanarayana & U. Chakrapani, *Biochemistry* (Hormones and Endocrinology sections), Elsevier, 2020.
3. Vasudevan D.M., Sreekumari S. & Vaidyanathan K., *Textbook of Biochemistry for Medical Students*, Jaypee Brothers Medical Publishers, 2019.
4. Ramadas Nayak & Rakshitha Nayak, *Fundamentals of Pathology* (Endocrine Pathology sections), Jaypee Brothers Medical Publishers, 2017.

References:

1. Jameson, J.L. & De Groot, L.J., *Endocrinology: Adult and Pediatric*, 7th Edition, Elsevier, 2016.
2. Bethesda, M. et al., *Clinical Endocrinology and Metabolism*, McGraw-Hill, 2018.
3. Harper's Illustrated Biochemistry, Rodwell V., Bender D. et al., McGraw-Hill, 2018 (Hormone and Endocrine metabolism chapters).
4. Cecil, R.L. & Goldman, L., *Cecil Textbook of Medicine* (Endocrinology sections), Elsevier, 2020.

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IMMUNOLOGY AND APPLIED MICROBIOLOGY

Code: 25ML502
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide a comprehensive understanding of the immune system, including its components, mechanisms, and role in protecting against infections. It also covers applied microbiology techniques for identifying and controlling clinically important microorganisms. The objective is to equip students with theoretical knowledge and practical skills essential for immunological and microbiological diagnostics in clinical and research laboratories.

UNIT I **(10 Hrs)**

- Immunology: Immunity, Components of the immune system- Organs of the immune system, B Lymphocytes and plasma cells, T lymphocytes and their subsets, and Natural killer cells, Macrophages and dendritic cells. Immune responses

UNIT II **(10 Hrs)**

- Types of hypersensitivity reactions, Autoimmunity, Cytokines, Antigen & Antibody Complement, Types of antigen-antibody reactions-Precipitation, Agglutination, Complement Fixation Test, Neutralization, ELISA, Immunofluorescence, Radioimmunoassay, Monoclonal Antibodies, Transplantation immunology and HLA typing

UNIT III **(10 Hrs)**

- Laboratory Diagnosis of- Urinary Tract Infections, Diarrhoea & Dysentery, Meningitis, Bloodstream infection, Respiratory infection, Sexually Transmitted Diseases, Viral hepatitis, HIV, Skin, soft tissue & wound infection.

UNIT IV **(10 Hrs)**

- Molecular techniques in diagnostic microbiology-PCR and its types.
- Biomedical waste management, Biosafety levels, and biosafety cabinets
- Health care-associated infections, occupationally acquired infections in health care settings
- Maintenance of laboratory records, Audit

Text Books:

1. K. S. Bhatia, *Essentials of Immunology*, Jaypee Brothers Medical Publishers, 2018.
2. Ananthanarayan R. & Paniker C.K.J., *Textbook of Microbiology*, Universities Press, 2017.
3. Ray, C.G. & Ryan, K.J., *Sherris Medical Microbiology*, 7th Edition, McGraw-Hill, 2022.
4. Talaro K.P. & Chess B., *Foundations in Microbiology*, 12th Edition, McGraw-Hill, 2021.

References:

1. Ivan M. Roitt, *Essential Immunology*, Wiley-Blackwell, 2018.
2. Richard A. Goldsby, Thomas J. Kindt & Barbara A. Osborne, *Kuby Immunology*, W.H. Freeman, 2018.
3. Koneman, E.W. et al., *Koneman's Color Atlas and Textbook of Diagnostic Microbiology*, 8th Edition, Lippincott Williams & Wilkins, 2021.
4. Murray, P.R., Rosenthal, K.S. & Pfaller, M.A., *Medical Microbiology*, 10th Edition, Elsevier, 2023.

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APPLIED HISTOLOGY, CYTOLOGY, AND CYTOGENETICS

Code: 25ML503
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide advanced knowledge of tissue structure, cellular analysis, and chromosomal studies. It emphasizes laboratory techniques for histological staining, cytological examination, and cytogenetic analysis. The objective is to equip students with practical skills necessary for accurate diagnosis and research in pathology and genetic disorders.

UNIT I: Applied Histology **(06 Hrs)**

- Handling of fresh histological specimens (Tissues).
- Lipids-identification and demonstration.
- Micro-organism in the tissues- various staining techniques for their demonstration and identification.
- Immunohistochemistry- common antigens and their applications.
- Electron microscope, working principles, components, and allied techniques for electron microscopy.
- Museum techniques.

UNIT II: Cytology **(06 Hrs)**

- Cervical cytology :- Basis of detection of malignant & premalignant lesion.
- Aspiration cytology: Principles, indications, and utility of the techniques
- Staining:- Pap stain, H&E stain & Giemsa stain.
- Cytology of various body fluids.

UNIT III: Cytogenetics **(08 Hrs)**

- Introduction, terminology, classification & nomenclature. B
- Blood groups:- Types & Bombay blood groups.
- Sex chromatin & identification
- Chromosomes in neoplasia & oncogenes/anti-oncogenes.
- Culture of bone marrow cells and peripheral blood lymphocytes.
- Characterization of human chromosomes by various banding techniques

UNIT IV: Immunopathology **(10 Hrs)**

- Cells of the immune system.
- Immunoglobulins, antibodies, and humoral immune response.
- Auto immune disease & investigation.
- Infection and the immune system
- Cancer immunology
- Tissue typing for kidney transplant.
- HLA Antigen
- Various grafts & graft versus host disease (GVHD).

UNIT V: Haematology **(10 Hrs)**

- Definition and classification of hemolytic anaemias :- Sickle cell anemia & Thalassemia.
- Laboratory investigation for haemolytic anaemia, including classification & causes.
- Leukemia: definition and classification
- Laboratory investigations for disseminated intravascular coagulation (DIC), Hemophilia
- Mechanism of fibrinolysis; tests for fibrinolysis.
- Platelet function test and its interpretation.
- Electrophoresis: Principles and applications in hematology

Text Books:

1. Junqueira, L.C. & Carneiro, J., *Junqueira's Basic Histology: Text and Atlas*, 16th Edition, McGraw-Hill, 2021.

2. Gartner, L.P. & Hiatt, J.L., *Color Textbook of Histology*, 4th Edition, Elsevier, 2018.
3. Indu Khurana, *Textbook of Histology, Cytology and Genetics*, Elsevier, 2019.
4. A.K. Datta, *Essentials of Cytogenetics*, Jaypee Brothers Medical Publishers, 2018.

References:

1. Young, B., O'Dowd, G. & Woodford, P., *Wheater's Functional Histology: A Text and Colour Atlas*, 7th Edition, Elsevier, 2021.
2. Hoffbrand, A.V. & Moss, P., *Essential Haematology*, 7th Edition, Wiley-Blackwell, 2016.
3. Bell, J., *Cytogenetics: A Practical Approach*, 3rd Edition, Oxford University Press, 2018.
4. Strachan, T. & Read, A., *Human Molecular Genetics*, 5th Edition, Garland Science, 2019.

RESEARCH METHODOLOGY AND BIOSTATISTICS

Code: 25ML504
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to introduce students to the principles of scientific research, study design, and data collection methods. It provides a foundation in biostatistical tools for analyzing and interpreting biomedical data. The objective is to equip students with the skills to conduct research, critically evaluate scientific literature, and apply statistical reasoning in clinical and laboratory settings.

UNIT I: Introduction **(06 Hrs)**

- Meaning, definition, characteristics of statistics
- Importance of the study of statistics
- Branches of statistics
- Statistics and health science, including nursing
- Parameters and estimates
- Descriptive and inferential statistics
- Variables and their types
- Measurement scales

UNIT II: Tabulation of Data **(06 Hrs)**

- Raw data, the array, frequency distribution
- Basic principles of graphical representation
- Types of diagrams - histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, Normal probability curve

UNIT III: Measure of Central Tendency **(08 Hrs)**

- Introduction: Uses, applications, and practical approach
- Definition and calculation of mean - ungrouped and grouped data
- Meaning, interpretation, and calculation of median ungrouped and grouped data
- Meaning and calculation of mode
- Comparison of the mean and mode
- Guidelines for the use of various measures of central tendency

UNIT IV: Measure of Variability **(10 Hrs)**

- Introduction: Uses, applications, and practical approach
- The range, the average deviation, or mean deviation
- The variance and standard deviation
- Calculation of variance and standard deviation for ungrouped and grouped data
- Properties and uses of variance and Standard deviation

UNIT V: Sampling Techniques **(10 Hrs)**

- Introduction: Uses, applications, and practical approach
- Criteria for good samples
- Application of sampling in the Community
- Sampling methods, sampling, and non-sampling errors
- Sampling variation and tests of significance

Text Books:

1. Kothari, C.R., *Research Methodology: Methods and Techniques*, 3rd Edition, New Age International Publishers, 2019.
2. Gopalakrishnan, S. & Ganesh, S., *Biostatistics*, 2nd Edition, Vijay Nicole Imprints, 2018.
3. Parmar, D.S., *Statistical Methods for Health and Medical Sciences*, CBS Publishers, 2017.
4. Bhanot, S., *Research Methods and Biostatistics*, Jaypee Brothers Medical Publishers, 2018.

References:

1. Hulley, S.B., Cummings, S.R., Browner, W.S., Grady, D., & Newman, T.B., *Designing Clinical Research*, 5th Edition, Lippincott Williams & Wilkins, 2019.
2. Siegel, S. & Castellan, N.J., *Nonparametric Statistics for the Behavioral Sciences*, 2nd Edition, McGraw-Hill, 2018.
3. Mann, P.S., *Introductory Statistics*, 9th Edition, Wiley, 2017.
4. Rao, C.R., *Linear Statistical Inference and Its Applications*, 2nd Edition, Wiley, 2018.

HOSPITAL MANAGEMENT AND MEDICAL ETHICS

Code: 25ML505
Internal Assessment: 30 Marks
Examination: 70 Marks
Total Marks: 100
Duration of Examination: 3 Hrs

Course Objectives: The course aims to provide students with knowledge of healthcare management principles, hospital administration, and operational procedures. It also emphasizes the importance of medical ethics, professional conduct, and patient rights. The objective is to prepare students to effectively manage clinical and laboratory services while upholding ethical standards in healthcare practice.

UNIT I **(06 Hrs)**

- Introduction to hospital staffing- Hospital staffing, administration, PACS, HIS, RIS, DICOM.
- Medical records and documentation.

UNIT II **(06 Hrs)**

- Legal & medical issues- Legal and Ethical issues towards patient rights, patient responsibility, legal concerns, History taking, patient monitoring, informed consent, malpractice, patient privacy issues.
- Professional ethics and Code of Conduct of a radiographer. Medical legal issues (MLC).

UNIT III **(08 Hrs)**

- Handling of patients: Seriously ill and traumatized patients, visually impaired, hearing and speech impaired patients, mentally impaired patients/psychological issues, infectious patients, critical/trauma patients, pregnant patients, patients with implants.
- Handling of patients with life-threatening diseases like HIV, STD, HBsAG, etc.

UNIT IV **(10 Hrs)**

- Departmental Safety & Infection Control: Safety and hazards from materials and electricity, etc.
- Biomedical waste management and control.
- Infection control, Skin care, donning of gowns, gloves, face masks, head caps, and shoe covers.
- Vital signs- Vital signs. How to measure vital signs.

- Body mechanics and transferring & shifting of patient
- Draw sheet lift, use of slide boards, wheelchair to couch, couch to wheelchair, couch to table, three men lift, and four men lift
- Orthodox & Austrian method, etc.
- First aid- Artificial respiration, hemostasis, first aid techniques, ABCD management.

UNIT V **(10 Hrs)**

- Anesthesia- Local anesthesia and general anaesthesia, uses in hospitals, Facilities regarding general Anaesthesia in different departments of the hospital.
- Management of adverse.

Text Books:

1. Dr. S. L. Goel, *Hospital Administration and Management*, CBS Publishers & Distributors, 2018.
2. R. K. Sharma, *Healthcare Management*, Jaypee Brothers Medical Publishers, 2019.
3. Berman, P., *Health Sector Reform in Developing Countries: Making Health Development Sustainable*, Oxford University Press, 2017.
4. Veena K., *Medical Ethics and Professionalism*, Jaypee Brothers Medical Publishers, 2018.

References:

1. Greenhalgh, T., *How to Read a Paper: The Basics of Evidence-Based Medicine*, 6th Edition, Wiley-Blackwell, 2019.
2. Beauchamp, T.L. & Childress, J.F., *Principles of Biomedical Ethics*, 8th Edition, Oxford University Press, 2019.
3. Karunakar, P., *Hospital Management: Principles and Practices*, Jaypee Brothers Medical Publishers, 2018.
4. Chandra, P., *Medical Ethics: Law & Practice*, 2nd Edition, CBS Publishers & Distributors, 2017.

DIAGNOSTIC ENDOCRINOLOGY PRACTICAL

Code: 25ML591
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on training in the collection, processing, and analysis of hormonal assays. It enables students to perform laboratory tests for diagnosing endocrine disorders accurately. The objective is to develop practical skills essential for endocrine diagnostics in clinical laboratory settings.

1. Estimation of TSH in a given sample by ELISA
2. Estimation of T3 in a given sample by ELISA
3. Estimation of T4 in a given sample by ELISA
4. Estimation of Prolactin in a given sample by ELISA
5. Estimation of Estradiol in a given sample by ELISA

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IMMUNOLOGY AND APPLIED MICROBIOLOGY PRACTICAL

Code: 25ML592
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on experience in immunological techniques such as antigen–antibody reactions and serological tests. It also trains students in the isolation, staining, and identification of clinically important microorganisms. The objective is to develop practical skills necessary for accurate immunological and microbiological diagnostics in clinical and research laboratories.

1. Antibiotic sensitivity testing-Kirby-Bauer method
2. Immunology Serological tests
    - Specimen collection, Principle, Methods, Procedure
    - Demonstration of HIV, HCV, HBC, Dengue
    - Rapid test for Malaria,
    - Demonstration of ASO, CRP, RA, Widal, VDRL, Typhidot
3. Applied Biomedical Waste management and maintenance of equipment
4. Hanging drop preparation
5. Culture methods
6. Introduction to biochemical reactions
7. Identification of bacterial culture
    - Colony characteristics
    - Morphological characteristics
    - Motility study
8. Interpretation of biochemical reactions
9. Antibiotic sensitivity testing-Kirby-Bauer method

APPLIED HISTOLOGY, CYTOLOGY, AND CYTOGENETICS PRACTICAL

Code: 25ML593
Internal Assessment: 20 Marks
Examination: 30 Marks
Total Marks: 50

Course Objectives: The course aims to provide hands-on training in histological tissue processing, cytological sample preparation, and chromosomal analysis. It enables students to perform staining, microscopic examination, and cytogenetic techniques accurately. The objective is to develop practical skills essential for diagnostic pathology, genetic analysis, and research applications.

1. Plasma hepatoglobin
2. Hemosiderinuria
3. Fetal hemoglobin
4. Electrophoresis of various hemoglobin
5. Sickening test
6. Investigation for G6PD Deficiency

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Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 mark each (1x10 = 10)
Answer any 10 out of 12 (Short 50-70 Words): 3 marks each (3x10 = 30)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 30 marks. The average of the two scores will be considered and scaled to 15 marks for the final assessment. Additionally, 5 marks will be awarded for assignments submitted, 5 for attendance, and 5 for general proficiency, for a total of 30 internal assessment marks.

Lab

Practical: 50 Marks
External: 30 Marks
Internal: 20 Marks

External Assessment: 30 Marks
Major Experiment: 12 marks
Minor Experiment: 08 marks
Viva: 05 marks
Practical record: 05 marks

Internal Assessment: 20 Marks
Experiment: 05 marks
Practical record: 05 marks
Attendance: 05 marks
Viva: 05 marks

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Syllabus for BMLT

Semester 6

Theory									
Course Code	**Topic**	**L**	**T**	**P**	**Credit**	**Theory Marks**	**Internal Marks**	**Practical Marks**	**Total Marks**
25ML601	Evaluation of Clinical Practice and Internship	0	18	0	18	0	400	0	400
25ML602	Technical Writing	3	0	0	3	0	100	0	100
	Total				**21**	**0**	**500**	**0**	**500**

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Detailed Syllabus

EVALUATION OF CLINICAL PRACTICE & INTERNSHIP

Code: 25ML601
Total Marks: 400

Course Objectives: The course aims to provide students with supervised, real-world clinical and laboratory experience to apply theoretical knowledge. It emphasizes skill development, professional behavior, and adherence to standard operating procedures. The objective is to evaluate competency, enhance practical expertise, and prepare students for independent clinical and laboratory practice.

Students will be sent for an Internship/Training for a period of 6 months. After completion of training, students are expected to submit a report along with a logbook, mentioning all the detailed information of training (Various tests performed, total number of patients attended, etc.).

BMLT Internship Report Formatting Guidelines

A Bachelor of Medical Laboratory Technology (BMLT) internship report should typically be 8,000-11,000 words, printed and hardbound with an enclosed CD copy. Use Times New Roman font, 12 pt size, black colour, 1.5 line spacing throughout; main headings centred in bold capital letters, subheadings left-aligned bold small letters; all margins 2.5 cm (1 inch); page borders only on top/bottom if required by institution. Number preliminary pages with small Roman numerals (i, ii), main body with Arabic numerals starting from 1; ensure originality, professional language, and relevance to lab rotations like haematology or biochemistry.

A. Preliminary Pages (Roman Numerals)

1. Cover/Title Page: Centred title ("Internship Report in Medical Laboratory Technology"), your name/registration, BMLT details, internship site/duration (e.g., 6 months at XYZ Hospital), submission date, university logo—no page number.
2. Declaration Page: Signed statement confirming originality and no plagiarism.
3. Approval/Certificate Page: Spaces for supervisor, HOD, and principal signatures with grades.
4. Acknowledgements: Thank mentors, lab staff, and family (1/2 page).
5. Abstract/Executive Summary: 200-300 words overview of objectives, activities, skills (e.g., specimen analysis), findings, and conclusions—written last.
6. Table of Contents: Auto-generated with sections/page numbers.
7. List of Tables/Figures/Abbreviations: Include if >5 items, with titles and pages.

B. Main Body (Arabic Numerals, Double-Sided Printing)

1. Chapter 1: Introduction (2-3 pages): BMLT context, internship goals, duration, methodology; bold chapter title centered, 14 pt.
2. Chapter 2: Organization Profile (3-4 pages): Hospital/lab structure, departments (e.g., blood bank), staff hierarchy—include org chart if relevant.
3. Chapter 3: Internship Activities/Rotations (10-15 pages core): Subsections (e.g., 3.1 Haematology, 3.2 Biochemistry) with dates, tasks (specimen collection, staining, equipment like analyzers), observations, challenges; use bullet lists for daily logs signed by supervisors; embed tables/figures with captions below (e.g., | Test | Result | Method |).
4. Chapter 4: Tools, Techniques, and Analysis (4-5 pages): Equipment (e.g., microscope calibration), protocols (safety, quality control), data interpretation; include SWOT analysis table.
5. Chapter 5: Observations, Learning, and Self-Evaluation (3-4 pages): Skills gained (e.g., report writing), difficulties, professional growth—be specific, reflective.

6. Chapter 6: Conclusion and Recommendations (1-2 pages): Key achievements, lab improvement suggestions.

7. References: APA style, 20+ sources (e.g., textbooks, journals)—hanging indent, 12 pt.

8. Appendices: Logbooks, checklists, photos of setups (blurred patient data), supervisor feedback—labelled A, B.

9. Proofread for typos; total length excludes appendices; submit hard/soft copies per guidelines.

TECHNICAL WRITING

Code: 25ML602
Total Marks: 100

Course Objectives: The course aims to develop students' ability to communicate scientific and technical information clearly and effectively. It emphasizes the structure, style, and formatting of reports, research papers, and laboratory documentation. The objective is to equip students with the skills necessary for accurate, professional, and impactful scientific communication in clinical and research settings.

- Students will be allotted a topic, or students are expected to select a topic of their choice.
- Students are expected to analyze not less than 5 review articles and will critically analyze the introduction, review of literature, material and methods, discussion, and conclusion.
- Students are expected to submit a brief write-up of these 5 review articles

Format for Brief Write-Up Review Articles
Use Times New Roman 12 pt font, 1.5 line spacing, 2.5 cm margins, and structured headings for clarity; cite in APA style with 10-20 references. Focus on critical analysis rather than reproduction of original content.

Header Information

1. Title: Exact article title [Author(s), Journal, Year, DOI/URL].
2. Your Details: Name, Affiliation (e.g., BMLT Student, Institution), Date.
3. Word Count: e.g., 450 words.
4. Structured Summary (150-250 words)
5. Background: 1-2 sentences on the review's scope and rationale (e.g., evolving role of biomarkers in disease diagnosis).
6. Key Findings: Bullet 4-6 main points with evidence highlights (e.g., - Validation of IVD methods improves accuracy by 20-30% [data trends]; - Challenges in interference reporting noted across studies).
7. Methods Reviewed: Overview of literature scope (e.g., 75-250 sources, 2015-2025), inclusion criteria.
8. Conclusions: Author's main takeaways and implications for lab practice.
9. Critical Analysis (100-150 words)
10. Strengths: Comprehensive coverage, critical viewpoints, novel insights.
11. Limitations: Gaps in recent data, regional bias, or overemphasis on certain methods.
12. Relevance to BMLT: Practical applications (e.g., in haematology rotations), future research needs.
13. References
    List 5-10 key sources from the article (Vancouver: Author. Title. Journal. Year; vol: pages). Append full article citation at the end.