



BACHELOR OF MEDICAL LABORATORY SCIENCE (BMLS)

SYLLABUS – 1st Year

EFFECTIVE FROM
ACADEMIC SESSION: 2026 ONWARDS

DEPARTMENT OF ALLIED HEALTH
(सहबद्ध स्वास्थ्य विभाग)

Faculty of Health Sciences, Jharkhand Rai University, Ranchi

SEMESTER-I

Program: BMLS
Semester: I
Course: Human Anatomy
Course Code: BMLS001

L	T	P	C
3	1	0	4

Course Outcome:

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

CO 1: Describe the anatomical terminology, body organization, tissues, and embryological development of the human body.

CO 2: Explain the structure and functions of the musculoskeletal, respiratory, digestive, cardiovascular, excretory, lymphatic, nervous, sensory, reproductive, and endocrine systems.

CO3: Identify major organs, tissues, and anatomical structures of different body systems using anatomical knowledge.

CO4: Analyze the structural relationships among body systems and correlate them with their functional roles in maintaining homeostasis.

CO5: Evaluate the clinical significance of normal anatomical structures to interpret common anatomical variations and disease conditions.

Course Content: Human Anatomy

Topics	Hours
Unit-I Introduction to Anatomy & Embryology	4
General Anatomy: Introduction to Anatomy, terms and terminology. Regions of Body, Cavities and Systems. Surface anatomy – Musculoskeletal, vascular, cardio-pulmonary system. General Embryology. Historical Development of Anatomy in Ancient India	
Unit-II Tissues & Histology	4
Tissues- Classification and description of the basic tissues of the body. Histology: Epithelium, compact bone, muscles, connective tissue, nervous tissue, artery, vein and lymphatic tissue. Connective tissue & its modification, tendons, membranes, and special connective tissue.	
Unit-III Musculoskeletal System	8
Musculoskeletal system: • Bone structure, blood supply, ossification, and classification. • Muscle classification, structure, types and functional aspects. • Joints–classification, structures of joints, movements, range, blood supply, nerve supply, dislocations	
Unit-IV Respiratory System & Thorax	6
Respiratory system: Structure of the upper and lower respiratory tract. Thorax: Pleural cavities & pleura, Lungs and respiratory tree, Heart and great vessels, Diaphragm	
Unit-V Digestive System	6
Digestive system - Parts/Structure of digestive system, Abdominal cavity - divisions, Muscles of abdominal wall, Liver, Pancreas, Spleen, Alimentary canal, Gall bladder, Intestine (small & large), and accessory organs of digestion	
Unit-VI Excretory & Lymphatic System	6
Excretory System: Anatomy of the Kidney. Structure of the kidney, ureter, urinary bladder, male and female urethra. General description of pelvic organs. Lymphatic system- Lymphatic vessels and lymph, lymph nodes, Spleen. Mediastinum – division and contents	
Unit-VII Cardiovascular System	8
Cardiovascular system: Circulatory system – major arteries and veins of the body, structure of blood vessels, Heart structure, positions, chambers, valves, internal & external features, Blood supply to heart, Conductive system of heart	
Unit-VIII Nervous System	6

Nervous system: Classification of the nervous system. Nerve – structure, classification, microscopy with examples. Spinal cord- anatomy, structure and features of Meninges, Ventricles of the brain, CSF circulation	
Unit-IX Sensory System	6
Sensory system: Structure of the Visual system, Auditory system, Gustatory system, Olfactory system, Somatosensory system, Skin	
Unit-X Reproductive & Endocrine System	6
Reproductive system: Structure of male and female reproductive organs. Endocrine system: Pituitary gland, Thyroid, Parathyroid	

Suggested Reading:

1. Ross and Wilson – *Anatomy and Physiology in Health and Illness*, 11th Ed., Elsevier
2. Chaurasia B.D. – *Human Anatomy*, 7th Ed., CBS Publishers
3. Gerard J. Tortora & Bryan H. Derrickson – *Principles of Anatomy and Physiology*, 14th Ed., Wiley
4. Frank H. Netter – *Atlas of Human Anatomy*, 7th Ed., Elsevier
5. Frederic H. Martini et al. – *Fundamentals of Anatomy and Physiology*, 9th Ed., Pearson
6. Gray's Atlas of Anatomy – Richard Drake, Elsevier
7. Manju Chugani & Preysi Chauhan – *Simplified Anatomy and Physiology for Paramedical Students*, Jaypee

Program: BMLS

Semester: I

Course: Human Physiology

Course Code: BMLS002

L	T	P	C
3	1	0	4

Course Outcome:

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

CO 1: Describe the structure and functions of cells, blood, muscles, nerves, and major organ systems of the human body.

CO 2: Explain the physiological mechanisms of the respiratory, digestive, renal, cardiovascular, endocrine, immune, and reproductive systems.

CO3: Apply physiological principles to interpret normal body functions and maintain homeostasis.

CO4: Analyze the integration and regulation of different body systems in maintaining normal physiological functions.

CO 5: Evaluate physiological changes associated with exercise, immunity, endocrine regulation, and reproductive processes in normal and altered conditions.

Course Content: Human Physiology

Topics	Hours
Unit I: Introduction to Physiology & Cell	4
General Physiology- Cell: morphology, structure and function of cell organelles, Structure of cell membrane, Transport across cell membrane, Intercellular communication, Homeostasis. Concept of Sharira Rachana in Ayurveda	
Unit II: Blood & Immunity	4
Blood- Introduction-composition & function of blood, WBC, RBC, Platelet's formation & functions, Immunity, Plasma: composition, formation & functions, Plasma Proteins: -types & functions, Blood Groups- types, significance, determination, Haemoglobin, Haemostasis.	
Unit III: Nervous System & Muscle	8
Nervous system and muscle: Organisation of the nervous system. Structure and function of muscle and nerve cells. Functions of the brain, the Spinal cord, the cranial and spinal nerves, and the Motor system. Sensory system. ANS, Synapse, neuromuscular transmission reflex arc, reflex action and reflexes, Cerebrospinal fluid	
Unit IV: Respiratory Physiology	6
Respiratory System: General organisation, Mechanics of respiration, Regulation of respiration, Gaseous exchange in lungs and tissues, Pulmonary ventilation, volumes and capacities, Effect of exercise on respiration, hypoxia.	
Unit-V Digestive Physiology	6
Digestive System- Digestion & absorption of nutrients, Gastrointestinal secretions & their regulation, Functions of Liver, pancreas & stomach, Gastrointestinal tract disorders	
Unit-VI Renal Physiology	6
Renal System: Functions of the kidney, urine formation, Glomerular filtration rate, clearance, Tubular function. Water excretion, concentration of urine-regulation of Na ⁺ , Cl ⁻ , K ⁺ excretion, Physiology of urinary bladder	
Unit-VII Lymphatic & Immune System	6
Lymphatic and immunological system: Lymph glands and circulation of lymph, Spleen structure and function, Immunity – Formation of T-cells and B-cells, Antigen, Antibody and Immune response.	
Unit-VIII Cardiovascular Physiology	8
Cardiovascular system: Functions of the heart, organisation of the cardiovascular system, structure and properties of cardiac muscles. Cardiac output, cardiac cycle, and conducting system of the heart. Heart sounds, regulation of heart rate, pulse, blood pressure and its regulation. ECG, cardio-respiratory changes during exercise	

Unit-IX Endocrine System	6
Endocrine system- Physiology of the endocrine glands – Pituitary, Pineal Body, Thyroid, Parathyroid, Adrenal, Gonads, Thymus, Pancreas. Hormones secreted by these glands, their classifications, and their functions.	
Unit-X Reproductive Physiology	6
Male and female reproductive system: Male: functions of testes & penis, pubertal changes in males, testosterone: action & regulations of secretion, ejaculatory mechanism & dysfunction Female: functions of ovaries and uterus, pubertal changes, menstrual cycle, oestrogens and progesterone action and regulation. Physiological changes during pregnancy, Placenta and placental circulation.	

Suggested Reading:

1. Guyton & Hall – *Textbook of Medical Physiology*, Elsevier
2. C.C. Chatterjee – *Human Physiology*, Medical Allied Agency
3. K. Sembulingam – *Essentials of Medical Physiology*, Jaypee
4. Gerard J. Tortora & Bryan H. Derrickson – *Principles of Anatomy and Physiology*, 14th Ed., Wiley
5. Ross and Wilson – *Anatomy and Physiology in Health and Illness*, 11th Ed., Elsevier

L	T	P	C
2	0	0	2

Program: BMLS

Semester: I

Course: Fundamentals of the Healthcare System and Medical Laboratory Science (MLS)

Course Code: BMLS003

Course Outcome:

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

CO 1: Describe the structure of the healthcare delivery system and the role of clinical laboratories in patient care.

CO 2: Explain laboratory organization, safety practices, biomedical waste management, and medical terminology used in healthcare.

CO3: Apply standard procedures for laboratory documentation, electronic health records, and safe laboratory practices.

CO4: Analyze laboratory workflow, health information systems, and infection control measures to improve laboratory quality and efficiency.

CO5: Evaluate the roles of regulatory bodies, professional ethics, and quality standards in ensuring safe and effective laboratory services.

Course Content: Fundamentals of the Healthcare System and Medical Laboratory Science (MLS)

Topics	Hours
Unit I: Healthcare Delivery System	6
Introduction to healthcare delivery system - Healthcare delivery system in India at primary, secondary and tertiary care, classification of hospitals based on system of medicine, Community participation in healthcare delivery system, National Health Mission, National Health Policy, Issues in Health Care Delivery System in India. Ancient Indian Concepts of Cellular Health and Homeostasis in Ayurveda	
Unit II: Clinical Laboratory Organization	8
Visit to Clinical laboratories, Introduction to clinical Laboratory, Classification of Laboratory, Introduction to various sections/departments in clinical laboratories, Lab space and designing, Knowledge of lab organisational chart, Role of Laboratory in patient care	
Unit III: Laboratory Safety & Biomedical Waste Management	4
Lab safety measures- Infection control, Universal precautions, PPE, Vaccination, Chemical, physical, electrical and fire safety. Biomedical waste management	
Unit IV: Laboratory Records & Health Information System	3
Records and their importance in a hospital, Records maintained in the Laboratory as per ISO 15189, importance of records and reports, Data entry and management on an electronic health record system	
Unit-V Medical Terminology	6
Medical terminology - Derivation of medical terms, Basic medical terms, form medical terms utilising roots, suffixes, prefixes, and combining roots, Interpret basic medical abbreviations/symbols	
Unit-VI Regulatory Bodies & Professional Ethics	3
Regulatory Bodies & Professional Organisations: Roles & Responsibilities – MoHFW, NCAHP, State Council, Registration	

Suggested Reading:

1. Textbook of Medical laboratory Technology, Mirnali Sant, CBS publishers. 2022
2. Textbook of Medical laboratory Technology, Ramnik Sood, Jaypee Publishers, 2006
3. Textbook of Medical laboratory Technology, Godkar PB, Bhalani Publishing House, 2024

Program: BMLS

Semester: I

Course: Communication and Professionalism

Course Code: BMLS004

L	T	P	C
2	0	0	2

Course Outcome:

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

CO 1: Describe the principles, process, and barriers of effective communication.

CO 2: Explain communication perspectives, verbal and non-verbal communication, and professional etiquette.

CO3: Demonstrate effective presentation, resume writing, interview, and workplace communication skills.

CO4: Analyze communication situations to identify barriers and apply appropriate strategies for effective interaction.

CO5: Evaluate professional and personal values to demonstrate ethical behavior, accountability, and professionalism in healthcare settings.

Course Content: Communication skills and Professionalism

Topics	Hours
Unit I: Communication Fundamentals	4
Communication Skills: The Importance of Communication, The Communication Process. Barriers to communication: Physiological, Physical, Cultural, Language, Gender, Interpersonal, Psychological and Emotional barriers	
Unit II: Communication Skills & Perspectives	4
Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment. Elements of Communication: Introduction, Face-to-Face Communication, Tone of Voice, Body Language (Non-verbal communication), Verbal Communication.	
Unit III: Professional Etiquette	4
Developing personal etiquette: personal appearance, importance of grooming, acknowledging and respecting, maintaining professionalism, cubicle etiquette, time management, attending classes, meetings, seminars, etc, table manners, greeting, Netiquette and Telephonic conversation	
Unit IV: Presentation & Career Skills	8
Developing presentation and career skills: Introduction, Importance of Resume and CV, preparing Resume and CV, Interview Skill Tips, FAQ During Interviews, Mock interviews	
Unit-V: Professional Ethics & Personal Values	6
Professional values - Integrity, Objectivity, Confidentiality, Professional competence and due care, professional risks, professional responsibility, accountability, professional success Personal Values - Ethical and Moral values, Attitude and behaviour, Personal Hygiene and Mental Health	

Suggested Reading:

1. Graham Lock, Functional English Grammar: Introduction to Second Language Teachers. Cambridge University Press, New York, 1996.
2. Gwen Van Servellen. Communication for Health care professionals: Concepts, practice and evidence, Jones & Bartlett Publications, USA, 2009

Program: BMLS

Semester: I

Course: Basic Emergency care and First aid

Course Code: BMLS005

L	T	P	C
1	1	0	2

Course Outcome:

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

CO1: Describe the principles of first aid, shock, poisoning, and Basic Life Support (BLS).

CO2: Explain the assessment of vital signs and the initial management of common medical emergencies.

CO3: Demonstrate appropriate first aid measures and adult/paediatric Basic Life Support techniques in emergency situations.

CO4: Analyze emergency situations to identify priorities and select appropriate first aid interventions.

CO5: Evaluate the condition of victims using vital signs and BLS protocols to support effective emergency response.

Course Content: Basic Emergency care and First aid

Topics	Hours
Unit I: First Aid Principles	10
First Aid-Introduction, Aims & objectives of first aid, Priorities of first aid, Golden rules of first aid, Qualities & responsibilities of first aider, Simple first aid measures in selected conditions like Food poisoning, Snake bite, Scorpion bite, Dog bite, foreign bodies in various organs, Burns, Haemorrhage. Traditional Indian Approaches to Emergency Care and First Aid	
Unit II: Shock Management	4
Shock- Definition, Types of shock, General Features of shock, Investigations of shock, Initial management & first aid of shock	
Unit III: Poisoning & Emergency Care	4
Poisoning- Definition, Causes of poisoning, Sources of Poisoning, Symptoms of poisoning, First aid & Management, Antidotes, Common drugs poisoning, Carbon monoxide poisoning	
Unit IV: Vital Signs & Chain of Survival	4
Introduction: Chain of survival, team dynamics & multi-rescuer resuscitation. Vital signs of patients- Body temperature, Pulse, Blood Pressure, Respiration	
Unit-V Basic Life Support (BLS)	8
Basic Life Support (BLS) in adults: Flowchart approach, approach to victim, techniques of CPR, BLS in paediatric Victims: checking pulse in children, chest compressions techniques, Bag mask ventilation technique	

Suggested Reading:

1. Manual of first aid, 1st edition, Gupta Abhitabh, 2012, Jaypee Publishers
2. Emergency medicine, 5th edition, SN Chugh, Ashimachugh 202, CBS publishers

Program: BMLS

Semester: I

Course: Basics of Computer Application

Course Code: BMLS006

L	T	P	C
1	0	1	2

Course Outcome:

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

CO 1: Describe the fundamentals of computers, hardware components, and their applications in healthcare.

CO 2: Explain the functions of operating systems, file management, and basic computer operations.

CO3: Demonstrate the use of internet services, email communication, and basic cybersecurity practices in healthcare settings.

CO4: Analyze healthcare data using computer applications and digital tools for efficient information management.

CO5: Evaluate the role of electronic health records and hospital information systems in improving healthcare services.

Course Content: Basics of Computer Application

Topics	Hours
Unit I: Introduction to Computers	3
Introduction to Computers: Generations of computers, Applications of computers, Parts of a Computer, I/O devices, computer uses in healthcare	
Unit II: Operating System Basics	2
Basics of Operating System: Introduction to OS, Features of Windows OS, File management, User interface basics	
Unit III: MS Word & PowerPoint	3
Microsoft Word and PowerPoint: Introduction to Word, typing medical documents, formatting, tables, inserting images, Introduction to PowerPoint, slide creation	
Unit IV: MS Excel & Access	2
Microsoft Excel, Access: Introduction to Excel and Access, Entering data, basic formulas, formatting cells, simple charts	
Unit-V Internet & Email	2
Internet & Email: Definition, types of networks, using browsers, opening email, attaching reports, basic internet safety	
Unit-VI Computers in Healthcare	3
Computers in Healthcare: Electronic health record, Hospital Information System basics, digital patient records, lab reporting usage	
Practical	30
1. MS Word – Document Creation- Resume, lab report typing, alignment, save & print 2. MS Word – Formatting & Tables- Medical charts, tables for patient information 3. MS Excel – Data Entry- Entering blood test reports and patient data 4. MS Excel – Basic Formulas- Average, sum, and conditional formatting 5. PowerPoint – Basic Slides- Creating a 5-slide presentation on hospital safety 6. Internet Browsing & Searching- Using Google for medical topics, downloading forms 7. Email Usage- Create an email, send a lab report with an attachment 8. MS Access database creation- Patient database creation 9. MS Access HTML integration in the database- Patient database creation views HTML webpage 10. Demonstrate use of Artificial Intelligence tools	

Suggested Reading:

1. V. Rajaramana, *Computer basics and programming*, PHI Learning Pvt. Ltd.
2. Michael Miller, *Computer Basics and Absolute Beginner's Guide*, Que Publishing

Program: BMLS

Semester: I

Course: Human Anatomy Lab. (Practical)

Course Code: BMLS007

L	T	P	C
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Course Outcome:

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

CO1: Recall anatomical positions, planes, and the microscopic structure of basic tissues.

CO2: Explain the structure and functions of the skeletal, respiratory, digestive, urinary, cardiovascular, nervous, sensory, and reproductive systems.

CO3: Identify the major organs and anatomical features of different human body systems using anatomical models and specimens.

CO4: Analyze the structural organization and functional relationships among the major organ systems of the human body.

CO5: Evaluate anatomical structures in relation to their physiological functions and clinical relevance.

Course Content: Human Anatomy Practical

Topics	Hours
Unit I: Anatomical Positions & Histology	12
Study of anatomical plans and positions Histological study of tissues	
Unit II: Skeletal & Respiratory System	12
Study of Skeletal system Study of respiratory system	
Unit III: Digestive & Urinary System	12
Study of digestive system Study of urinary system	
Unit IV: Cardiovascular & Nervous System	12
Study of Cardiovascular system Study of Nervous system	
Unit-V Sensory Organs & Reproductive System	12
Study of sensory organs: eye, ear, nose, tongue and skin Study of reproductive system	

Suggested Reading:

1. Frank H. Netter – *Atlas of Human Anatomy*, 7th Ed., Elsevier
2. Frederic H. Martini et al. – *Fundamentals of Anatomy and Physiology*, 9th Ed., Pearson
3. Gray's Atlas of Anatomy – Richard Drake, Elsevier

Program: BMLS

Semester: I

Course: Human Physiology Lab. (Practical)

Course Code: BMLS008

L	T	P	C
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Course Outcome:

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

CO 1: Describe the principles and procedures of blood collection and haemoglobin estimation.

CO 2: Explain the methods of blood cell counting, blood smear preparation, staining, and vital sign measurement.

CO3: Perform routine haematological investigations, ECG, EMG, reflex testing, and pulmonary function tests using standard laboratory procedures.

CO4: Analyze haematological, cardiovascular, neuromuscular, and pulmonary test findings for normal and abnormal patterns.

CO5: Evaluate laboratory and physiological test results to support basic clinical assessment and diagnosis.

Course Content: Human Physiology Practical

Topics	Hours
Unit I: Blood Collection & Haemoglobin Estimation	15
Perform blood collection Estimation of Haemoglobin	
Unit II: Haematological Techniques	15
Demonstrate blood cell count – RBC count and WBC count Prepare blood smear and staining	
Unit III: Cardiovascular Assessment	10
Measure Blood pressure and Pulse Rate Demonstration of ECG	
Unit IV: Neuromuscular Assessment	10
Demonstration of EMG Perform Reflexes testing	
Unit-V Pulmonary Function Testing	10
Spirometry and PFT (Pulmonary function test)	

Suggested Reading:

1. K. Sembulingam – *Essentials of Medical Physiology*, Jaypee
2. Gerard J. Tortora & Bryan H. Derrickson – *Principles of Anatomy and Physiology*, 14th Ed., Wiley
3. Ross and Wilson – *Anatomy and Physiology in Health and Illness*, 11th Ed., Elsevier

SEMESTER-II

Program: BMLS

Semester: II

Course: Fundamental of Microbiology

Course Code: BMLS009

L	T	P	C
4	0	0	4

Course Outcome:

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

CO 1: Describe the history, principles of microscopy, bacterial morphology, physiology, and genetics.

CO 2: Explain sterilization, disinfection, culture media, bacterial culture methods, and mechanisms of microbial infection.

CO3: Perform bacterial staining, culture, identification, and antibiotic susceptibility testing using standard microbiological techniques.

CO4: Analyze microbiological findings to identify bacteria and interpret laboratory test results for clinical diagnosis.

CO 5: Evaluate appropriate microbiological methods for infection control, bacterial identification, and antimicrobial susceptibility testing.

Course Content: Fundamental of Microbiology

Topics	Hours
Unit I: History of Microbiology	3
Historical Development of Microbiology: Infection and Contagion, Discovery of Microorganisms, Conflict over Spontaneous Generation, Role of Microorganisms in Diseases, Scientific Development of Microbiology - Louis Pasteur, Joseph Lister, Robert Koch, Paul Ehrlich, Edward Jenner, Ignaz Semmelweis, Antony van Leeuwenhoek. Ancient Indian Concepts of Infection and Contagion	
Unit II: Microscopy	7
Microscopy: Light Microscopy, Bright-field microscopy, Dark-ground microscopy, Phase-contrast microscopy, Fluorescence microscopy, Electron microscopy	
Unit III: Bacterial Morphology & Staining	7
Morphology of Bacteria: Comparison of Prokaryotic Cells–Eukaryotic cells, size of bacteria, arrangement of bacterial cells, Anatomy of the bacterial cell- the structure, function, and clinical significance of - Cell wall, Cell membrane, Cell surface appendages, Bacterial Capsule, Cell organelles, plasmid, Spore. Principles of staining - Simple staining, Negative staining, Differential staining, Gram's and acid-fast staining, Albert's, Flagella staining, Capsule staining, Endospore staining	
Unit IV: Bacterial Physiology	6
Physiology of Bacteria: generation time of bacteria, bacterial growth curve, bacterial nutrition, bacterial metabolism.	
Unit-V Bacterial Genetics	5
Bacterial Genetics: Different gene transfer methods: Transformation, Transduction, Lysogenic conversion, Conjugation.	
Unit-VI Sterilization & Disinfection	7
Sterilisation and Disinfection: Classify sterilisation methods - Dry heat sterilisation, Moist heat sterilisation, Radiation, Filtration. Disinfection- Classify disinfectants, general features of disinfectants - Alcohols and aldehydes, Dyes, halogens and phenols - Gases, surface active agents and metallic salts, Testing of disinfectants - Rideal Walker method, Chick Martin test, Disinfectant kill time test, Kelsey-Sykes test, In-use test, Advanced techniques in Sterilisation of Heat-Sensitive Articles.	
Unit-VII Culture Media & Culture Methods	5
Culture Media and Methods: Culture Media- common ingredients of culture media, classification of media. Culture Methods- Methods of bacterial culture, aerobic culture, anaerobic culture, methods of anaerobiosis, methods of isolating pure cultures.	
Unit-VIII Bacterial Identification	8

Identification of Bacteria: Methods used to identify bacteria, phenotypic characteristics, genomic characterisation, Bacterial Taxonomy-Taxonomy, Identification, classification systems, Identification of Bacteria by biochemical tests and automated systems: Bac T alert and BACTEC systems, -VITEK and Phoenix systems - RTPCR, MALDI-TOF	
Unit-IX Antibiotic Susceptibility Testing	6
Antibiotic susceptibility testing (AST): A. Diffusion methods 1. Kirby–Bauer disk diffusion method 2. Stokes disk diffusion method B. Dilution methods 1. Broth dilution method 2. Agar dilution method. Epsilometer or E-test, Minimum inhibitory concentration (MIC) and Minimum bactericidal concentration (MBC) of antibiotics.	
Unit-X Microbiome & Infection	6
Human Normal Microbial Flora and Microbiome: Microbial Infections- Microorganisms and Host, Infection and Infectious Disease, Classification of Infections, Sources and Modes of Transmission of Infection, Epidemiological Terminologies	

Suggested Reading:

1. Mackie & McCartney – *Practical Medical Microbiology*, Elsevier
2. Bailey & Scott – *Diagnostic Microbiology*, Elsevier
3. R. Ananthanarayan & C.K. Jayaram Paniker – *Textbook of Microbiology*, Universities Press
4. Surinder Kumar – *Essentials of Microbiology*, Jaypee Brothers Medical Publishers
5. Subhash Chandra Parija – *Textbook of Microbiology and Immunology*, Elsevier
6. Lansing M. Prescott – *Microbiology*, McGraw-Hill
7. Apurba Sankar Sastry & Sandhya Bhat K – *Essentials in Medical Microbiology*, Jaypee Brothers Medical Publishers
8. Praful B. Godkar & Darshan P. Godkar – *Textbook of Medical Laboratory Technology*, Bhalani Publishing

Program: BMLS

Semester: II

Course: Basics of Biochemistry

Course Code: BMLS010

L	T	P	C
4	0	0	4

Course Outcome:

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

CO1: Describe the fundamental concepts of biochemistry, laboratory solutions, pH, buffers, and biomolecules.

CO2: Explain the structure, classification, properties, and biological importance of carbohydrates, lipids, proteins, nucleic acids, enzymes, vitamins, and minerals.

CO3: Apply basic biochemical principles to laboratory practices, enzyme activity, and nutritional assessment.

CO4: Analyze the relationship between the structure and function of biomolecules, enzymes, and nutrients in human metabolism.

CO5: Evaluate the role of nutrition, vitamins, minerals, and energy metabolism in maintaining health and preventing metabolic disorders.

Course Content: Basics of Biochemistry

Topics	Hours
Unit I: Basic Biochemistry & Laboratory Concepts	4
Introduction to Biochemistry: Units of weight and volume, Preparation of solutions (percentage, Molarity, Normality), Basic concepts of acids, bases, and buffers, their application in the Laboratory. Definition and determination of pH. Preparation of distilled water, double-distilled water, and deionised water. Fundamental concepts on biophysical phenomena like osmosis, dialysis, colloidal state, viscosity, adsorption, osmotic pressure, and surface tension.	
Unit II: Chemistry of Carbohydrates	7
Chemistry of Carbohydrates: Introduction to carbohydrates, biological importance of carbohydrates, classification, physical and chemical properties. Carbohydrates in Ayurveda and Traditional Indian Nutrition	
Unit III: Chemistry of Lipids	7
Chemistry of lipids: Introduction to lipids, biological importance of lipids, Classification of lipids, Physical and chemical properties, Cholesterol and lipoproteins	
Unit IV: Chemistry of Amino Acids & Proteins	10
Chemistry of Amino acids & Proteins: Introduction to amino acids, biological importance of Amino acids, classification of amino acids. Introduction to proteins, the biological importance of proteins. Classification of proteins, Structural organisation of Proteins, Physical and chemical properties of Proteins and Amino acids	
Unit-V Chemistry of Nucleic Acids	8
Chemistry of Nucleic acids: Introduction to Nucleic acids, nucleotides, nucleosides, biological importance of Nucleic acids, Structure of DNA and RNA, Difference between DNA and RNA	
Unit-VI Chemistry of Enzymes	8
Chemistry of Enzymes: Introduction of enzymes, classification of enzymes, Coenzymes and Cofactors, Active site, Mechanism of action, Factors influencing enzyme action, Enzyme inhibition and regulation.	
Unit-VII Vitamins & Minerals	12
Vitamins & Minerals: Introduction to vitamins, Classification, RDA, Chemistry and biochemical function, deficiencies and toxic manifestations Introduction to minerals, Classification, RDA, Chemistry and biochemical function, deficiencies and toxic manifestations, Special references to calcium, phosphorus, magnesium, iron, zinc and copper	

Unit-VIII Nutrition & Energy Metabolism	04
Nutrition: Calorie Requirements, SDA and BMR, Respiratory Quotient, Glycemic Index, Balanced Diet and Energy Calculations, Formulation of diet and dietary fibre, Starvation, obesity, and Protein Energy Malnutrition	

Suggested Reading:

1. U. Sathyanarayana – *Biochemistry*, Elsevier
2. Robert K. Murray et al. – *Harper's Illustrated Biochemistry*, Tata McGraw-Hill
3. M.N. Chatterjee & Rana Shinde – *Textbook of Medical Biochemistry*, Jaypee
4. Alan Gowenlock – *Varley's Practical Clinical Biochemistry*, CBS

Program: BMLS

Semester: II

Course: Fundamentals of Haematology

Course Code: 42AMLS011

L	T	P	C
4	0	0	4

Course Outcome:

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

CO1: Describe the composition of blood, haematopoiesis, and the structure and functions of blood cells.

CO2: Explain hemoglobin synthesis, hemostasis, hematocrit, ESR, and the clinical significance of normal and abnormal blood cells.

CO3: Apply appropriate techniques for blood collection, anticoagulant selection, staining, and routine haematological investigations.

CO4: Analyze haematological findings, including blood cell abnormalities, coagulation disorders, and laboratory parameters for clinical interpretation.

CO5: Evaluate automated haematology results and implement quality assurance measures to ensure reliable laboratory reporting.

Course Content: Fundamentals of Haematology

Topics	Hours
Unit I: Blood & Haematopoiesis	10
Introduction to blood, composition and function of normal cellular components. Haematopoiesis: Site of haematopoiesis, Bone marrow and Bone marrow collection; Cellular ratio, bone marrow biopsy and aspiration techniques and their indications for collection. Rakta Dhatu in Ayurveda	
Unit II: Erythrocytes & Hemoglobin	10
Erythrocytes: Normal Structure, Function, and Fate of Erythrocytes along with Clinical Indications of Jaundice, Normal Range. Abnormal Red Blood Cells: Anisocytes, Poikilocytes, and their clinical significance Hemoglobin: Structure, composition and function, synthesis and regulation of hemoglobin, oxygen association and dissociation curve Various types of hemoglobin with clinical significance - Fetal hemoglobin, Meth-hemoglobin, Sulf-haemoglobin, Carboxyhemoglobin, Sickle hemoglobin, Glycosylated hemoglobin, different methods of estimation	
Unit III: Leucocytes	10
Leucocytes: Structure, functions, normal range, lifespan of normal White Blood Cells. Quantitative and qualitative disorders of White Blood Cells: physiological and pathological causes	
Unit IV: Platelets & Hemostasis	10
Thrombocytes: Structure, functions, normal range, lifespan of normal Platelets. Quantitative disorder of Platelets: physiological and pathological causes Normal hemostasis and physiological properties of coagulation factors. Primary, secondary and tertiary hemostasis. Role of the platelets, coagulation factors, coagulation inhibitory system and fibrinolysis.	
Unit-V Hematocrit & ESR	5
Hematocrit and Erythrocyte Sedimentation Rate: physiological and pathological causes	
Unit-VI Haematology Automation & Quality Assurance	8
Automation in Haematology lab: principles and analysis Quality assurance in Haematology, Internal and external quality control, including reference preparation, Routine quality assurance protocol, Statistical analysis, i.e. Standard deviation, Coefficient of variation, accuracy and precision	

Unit-VII Anticoagulants, Blood Collection & Staining	7
Anticoagulants: types, mode of action and preference of anticoagulants for different haematological studies. Different types of blood collection, including the preservation of blood samples for various haematological investigations. Principles of Romonowsky stain with examples and its applications	

Suggested Reading:

1. Godkar, P. B., & Godkar, D. P. (2006). *Textbook of medical laboratory technology*. Bhalani publishing house.
2. Dacie, J. V. (2006). *Dacie and Lewis practical haematology*. Elsevier Health Sciences.
3. Firkin, F., Chesterman, C., Rush, B., & Pennigton, D. (2008). *De Gruchy's Clinical haematology in medical Practice*. John Wiley & Sons.
4. McPherson, Richard A.. (2022). *Henry's clinical diagnosis and management by laboratory methods, 24th ed. (24).* : Elsevier.

Program: BMLS

Semester: II

Course: Preventive and Social Medicine

Course Code: BMLS012

L	T	P	C
2	0	0	2

Course Outcome:

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

CO1: Describe the principles of epidemiology, infection control, and primary health care.

CO2: Explain demographic concepts, family welfare programmes, and environmental health measures.

CO3: Demonstrate effective communication and health education strategies for patient and community care.

CO4: Analyze public health issues and recommend appropriate preventive and control measures for communicable diseases.

CO5: Evaluate patient care practices, health programmes, and infection prevention strategies to promote community health.

Course Content: Preventive and Social Medicine

Topics	Hours
Unit I: Basic Epidemiology & Infection Control	3
Basic Epidemiology: Epidemiological Triad, Carrier, Reservoir, Host for infection and diseases, Various methods of disinfection used at each level of healthcare, Incubation period, Nosocomial Infections. Ancient Indian Concepts of Disease Prevention and Public Health (Janapadodhwansa and Swasthavritta)	
Unit II: Primary Health Care & National Health Programmes	7
Primary Health Care: Principles, Elements, Health Programmes - Maternal and Child Health, Nutrition, Environment, older adults, Central Government Health Schemes, Occupational Health, Voluntary Health Agencies, Role of NGOs in the Health Team.	
Unit III: Demography & Family Welfare	3
Demography and Family Welfare: Definition, Demographic cycle, Population Explosion, Factors influencing population growth, death rate, birth rate, and methods of contraception. Family Welfare – Definition, Objectives of Family Planning. Types: Temporary and Permanent methods, Follow-up of contraceptive methods, Family planning counselling.	
Unit IV: Environmental Health & Waste Management	7
Environmental Health: Air Pollution, Noise Pollution, Water Pollution, with the causes, effects, and preventive measures. Solid Waste Management - Swachh Bharat Abhiyan, Nirmal Bharat Abhiyan. Biomedical Waste Management Rules 2016 - colour coding and disposal into correctly colour-coded bags. Disease Elimination and Disease Eradication: Examples.	
Unit-V Health Education, Communication & First Aid	8
Communication and Health Education: Health education–definition, principles, objectives, purpose, types, and AV aids. Communication–definition, process, and types. Behavioural change communication. IEC (Information, education, and communication): aims, scope, concept, and approaches. First-aid–Definition, Principles, Golden rules, and bandages. First-aid for fracture, bleeding, drowning, Convulsions, Foreign Bodies, poisoning, Shock, and Cardio-Pulmonary Resuscitation. Role and skill of health professional in Health Education; Interpersonal relationship: coordination and cooperation in health education with other members of the health team.	
Unit-VI Care of Patients with Communicable Diseases	2
Patient care in Communicable Diseases: Care of patients with communicable diseases, Isolation methods, Standard safety measures (Universal precautions). Role and skill of the Health professional in the management of patients with communicable diseases.	

Suggested Reading:

1. Textbook of Preventive and Social Medicine – J.E.Park
2. Manual for Laboratory Technician – 1985. DGHS, Ministry of Health, Govt of India

Program: BMLS

Semester: II

Course: Fundamental of Microbiology Practical

Course Code: BMLS013

L	T	P	C
0	0	4	2

Course Outcome:

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

CO1: Describe the principles of specimen collection, transport, laboratory safety, and sterilization methods used in microbiology.

CO2: Explain the procedures for microscopy, staining, media preparation, and quality control in the microbiology laboratory.

CO3: Perform specimen processing, sterilization, staining techniques, and preparation of culture media following standard laboratory protocols.

CO4: Analyze the effectiveness of sterilization, staining, and quality control procedures to ensure reliable microbiological results.

CO5: Evaluate laboratory practices and quality assurance measures to maintain accuracy, safety, and contamination-free microbiological investigations.

Course Content: Fundamental of Microbiology Practical

Topics	Hours
Unit I: Specimen Collection & Laboratory Safety	12
Demonstrate the collection of various clinical specimens and their transport and processing. Demonstrate a safe code of practice in the Microbiology laboratory	
Unit II: Sterilization & Microscopy	12
Demonstrate cleaning and sterilisation of glassware Perform microscopy and specimen processing Operate the autoclave and hot air oven, including its efficacy testing.	
Unit III: Media Preparation & Disinfection	12
Demonstrate the sterilisation of reagents and culture media Demonstrate sterilisation of media/solution by filtration. Demonstrate the proper precautions to take when using disinfectants and dilution of commonly used disinfectants.	
Unit IV: Microbiological Staining Techniques	12
Demonstrate Simple staining Demonstrate Gram's staining	
Unit-V Culture Media Preparation & Quality Control	12
Demonstrate Preparation of stains, reagents and culture media, quality control of reagents and media, and sterility check Identify QC strains used for culture media	

Suggested Reading:

1. Subhash Chandra Parija – *Textbook of Microbiology and Immunology*, Elsevier
2. Lansing M. Prescott – *Microbiology*, McGraw-Hill
3. Apurba Sankar Sastry & Sandhya Bhat K – *Essentials in Medical Microbiology*, Jaypee Brothers Medical Publishers

Program: BMLS

Semester: II

Course: Basics of Biochemistry Practical

Course Code: BMLS014

L	T	P	C
0	0	4	2

Course Outcome:

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

CO1: Identify laboratory apparatus, glassware, balances, and safety practices used in the biochemistry laboratory.

CO2: Explain the principles of reagent preparation, water purification, pH measurement, and qualitative biochemical tests.

CO3: Perform reagent preparation and qualitative analysis of carbohydrates, proteins, amino acids, and lipids using standard laboratory techniques.

CO4: Analyze the observations obtained from qualitative biochemical tests to identify unknown biomolecules.

CO5: Evaluate laboratory procedures and test results to ensure accuracy, reliability, and quality in biochemical analysis.

Course Content: Basics of Biochemistry Practical

Topics	Hours
Unit I: Laboratory Apparatus & Glassware Handling	12
Demonstrate the use of Laboratory Apparatus, Micropipettes, and their uses Demonstrate cleaning of glassware	
Unit II: Laboratory Measurements & Reagent Preparation	12
Demonstrate the use of a laboratory balance Prepare and label common Laboratory reagents (Percentage, Molarity, Normality)	
Unit III: Water Purification & pH Measurement	12
Preparation of distilled water, double-distilled water, and deionised water. Measure pH for laboratory reagents/ biological samples	
Unit IV: Qualitative Analysis of Carbohydrates and Proteins	12
Perform qualitative analysis of carbohydrate and identification of unknown carbohydrate- Molisch test, Benedict test, Modified Bareford test, Seliwanoff test, Bial test, Mucic acid test, Iodine test, Foulger's test, osazone test Perform qualitative analysis of protein and amino acids- Precipitation test - Heat and acetic acid Test, Heller's test, alkali, alcohol, Isoelectric point precipitation. Colour reaction – Ninhydrin, Nitroprusside test, Xanthoproteic test, million test, Sakaguchi test	
Unit-V Qualitative Analysis of Lipids	12
Perform qualitative analysis of lipids – Solubility test	

Suggested Reading:

1. U. Sathyanarayana – *Biochemistry*, Elsevier
2. Robert K. Murray et al. – *Harper's Illustrated Biochemistry*, Tata McGraw-Hill
3. M.N. Chatterjee & Rana Shinde – *Textbook of Medical Biochemistry*, Jaypee
4. Alan Gowenlock – *Varley's Practical Clinical Biochemistry*, CBS

Program: BMLS

Semester: II

Course: Fundamentals of Hematology Practical

Course Code: BMLS015

L	T	P	C
0	0	4	2

Course Outcome:

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

CO1: Explain laboratory safety practices, biomedical waste management, and pre-analytical procedures in hematology.

CO2: Perform blood collection and routine hematological investigations using standard laboratory techniques.

CO3: Operate basic hematology equipment and calculate hematological parameters accurately.

CO4: Analyze hematological findings from manual and automated methods to identify normal and abnormal results.

CO5: Evaluate the quality and reliability of hematological test results by recognizing sources of error and applying quality control measures.

Course Content: Fundamentals of Hematology Practical

Topics	Hours
Unit I: Laboratory Safety & Pre-Analytical Procedures	12
Demonstrate laboratory safety and biomedical waste management Pre-analytical variables in clinical Laboratory: Patient and test request form identification, Patient preparation for phlebotomy, Sources of error in venous blood sample collection Sample transport, processing, Sample acceptance and rejection criteria	
Unit II: Blood Collection & Basic Hematology Tests	12
Perform blood collection and demonstrate the order of draw Estimation of hemoglobin by Drabkin's method Perform Packed Cell Volume	
Unit III: Blood Smear & Differential Cell Count	12
Perform ESR by the Westergren method Stain and examine the blood smear using Romanowsky stain Perform Differential Leucocyte Count	
Unit IV: Blood Cell Counting Techniques	12
Perform RBC count Perform WBC count Perform Absolute Eosinophil count Perform Platelet count	
Unit-V Hematological Indices & Automated Analysis	12
Calculation of Red Cell Indices Perform Bleeding Time and Clotting Time Operate automated cell counters and interpret results Perform Reticulocyte count	

Suggested Reading:

- Godkar, P. B., & Godkar, D. P. (2006). *Textbook of medical laboratory technology*. Bhalani publishing house.
- Dacie, J. V. (2006). *Dacie and Lewis practical haematology*. Elsevier Health Sciences.
- Firkin, F., Chesterman, C., Rush, B., & Pennigton, D. (2008). *De Gruchy's Clinical haematology in medical Practice*. John Wiley & Sons.