JHARKHAND Rai University

Bachelor of Science (Honours) in Medical Laboratory Technology (BMLT)

EFFECTIVE FROM
ACADEMIC SESSION
2025-2026 onwards

SYLLABUS

Semester-I

Program: BMLT
Semester: I
Course: Human Physiology &Anatomy-I
Course Code: 42ABMT001

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

CO 1: Understand the basics of anatomy and physiology and their functions.

CO 2: Understand the contributions of anatomical system, structure ofskeleton system and its applications.

CO 3: Understand about the body fluids and their classifications,morphology, function

CO 4: Understand about the anatomy of respiratory, digestive, liver andtheir functions that help for medical technology.

CO 5: Understand about the human circulatory system and concepts of bloodcirculation and challenges of abnormalities.

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Course Content: Human anatomy & Physiology-I

Topics	Hours
Module I: The anatomic and physiological organization of human body:	**9**
Definition of cell and its types, tissues, organs and related terms, Structure of cells and its organelles, Anatomy and its classifications and related terms, Structural organization of the human body, Characteristic of human living beings.	
Unit II: Skeletal system, bones, joint and muscle:	**9**
Definition of skeleton system, Types of bones, structure, growth of bones and its functionDivision of Skeleton system- Appendicular & Axial, Name of major bones and their partsJoints and its classifications & Muscles and their functions.	
Unit III: The body fluids, blood morphology, chemistry and their function:	**9**
Definition of blood, properties and its function, Classification of blood, morphology and chemistry of RBC, WBC and Platelets, Blood grouping system- ABO, Rh factors and other types, Role of body fluids, coagulant & anti-coagulants and clotting factors, Hemopoiesis and related terms.	
Unit IV: The Respiratory system, digestive system, structure of liver and their functions	**9**
Introduction of respiratory system and organs involved, Anatomical studies of respiratory system and their functions, Introduction of digestive system and organs involved, Anatomical studies of digestive system and their functions, Anatomical structure of liver and their functions.	
Unit V: Cardiovascular system and its functions:	**9**
Introduction of human heart, position, chambers and its size, Anatomy structure of human heart, flow of circulations and their functions, Role of cardiac cycle, heart rate, cardiac output and related terms, Measurement of pulse, blood pressure and auscultation for heart sounds, Cardiovascular system related abnormalities.	

Suggested Reading:

1. Best and Taylor's Physiological Basis of Medical Practice, William & Wilkins, Baltimore.
2. Human Anatomy – Regional &Applied, Chaurasia; Part I, II, III, CBS Publishers &Distributors.
3. Human Physiology, C.C. Chatterjee Vols. I & II, Medical Allied Agency, Calcutta.
4. Textbook of Medical Physiology. Guyton & Hall, WB Saunders Company.

Program: **BMLT**
Semester: I
Course: Laboratory Equipment & Glassware
Course Code:42ABMT002

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Course Outcome:

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

CO1: Understanding for applications of commonly used laboratory glassware's and equipment.

CO2: Concept of basic laboratory safety and code of conduct for medical laboratory personnel.

CO3: Knowledge of hazardous reagents and precautions in handling these chemicals.

CO4: Awareness of recording of various physiological parameters and their analysis.

CO5: Techniques for collection of various types of specimens.

Course Content: Laboratory Equipment & Glassware

Course Content	Hours
Unit I: Common laboratory glassware's equipment's and safety rule	**9**
Introduction to Common Laboratory Glassware, Introduction to basic Laboratory Equipments. **Introduction to Indian Knowledge System (IKS) in Laboratory Science.** Introduction to Laboratory Setup, Overview of a standard laboratory, Types of laboratories (chemical, biological, physical), Lab safety rules and protocols Personal protective equipment (PPE).	
Unit II: **Measuring and Dispensing Equipment**	**9**
Balances: analytical vs. top-loading Pipettes: manual, automatic, micropipettes Volumetric measurements: accuracy and calibration Common errors in measurement, vortex machines	
Unit III: **Safety and Waste Management**	**9**
Handling hazardous chemicals and biological specimens' sharps disposal and glass breakage protocols, Chemical waste segregation. Emergency response (spills, fires, exposure Biomedical waste management. **Safety and Waste Management in Indian Knowledge System (IKS)**	
Unit IV: Recording of various physiological parameters	**9**
Recording of Physiological Parameters - body temperature, pulse and respiration. Auscultation for Heart Sounds Artificial Respiration Determination of respiratory Parameters- Vital capacity, Tidal Volume etc.	
Unit V: Phlebotomy	**9**
Introduction to techniques of Phlebotomy (Specimen Collection)Separation of Serum & Plasma, Vial and types of vials and precaution during Phlebotomy	

Suggested Books & Readings:

S. No.	Title	Author, Publisher, Edition and Year of publication
1	Clinical Laboratory Science: Concepts, Procedures, and Clinical Applications	Mary Louise Turgeon 5th editions 2024
2	Laboratory Manual for Laboratory Procedures for Medical Office Personnel	Loretta Manning 7th editions 2023
3	Manual of Laboratory and Diagnostic Tests	Frances Fischbach, Margaret Fischbach 4th 2020

Program: BMLT
Semester: I
Course: Chemistry for MLT
Course Code: 42ABMT003

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

CO 1: Understand the fundamental knowledge of measurement, chemical calculation & their uses.

CO2: Learn about the properties of various elements and different types of bonding for understanding its application in Paramedical domain.

CO3: Understand and apply the knowledge of chemical equilibrium as required in core area.

CO4: Understand the concept of Chemical kinetics, surface phenomena colloids and its application.

CO5: Understand the basic ideas of Organic Compound and their reaction mechanism.

Course Content: Chemistry for MLT

Topics	Hours
Unit I: Chemical equation and Calculation:	**12**
Atomic weight, AMU, molecular weight & equivalent weight Mole concept (numerical problems) Concentration terms (Molarity, Normality, Molality, PPM) with numerical Oxidation number Stoichiometry (balancing of chemical equation and calculationsusing	
Unit II: Periodic Table & Chemical Bonding	**12**
Periodic table & periodic properties. Valancy, Cause of bonding, Electrovalent, Covalent and Coordinate bond, valance bond theory, VSEPR theory Hybridization and prediction of shape of molecules & ions Molecular orbital theory, M.O. diagram for diatomic molecules, Hydrogen bond.	
Module III: Concepts of Acids and Bases & Equilibrium	**12**
Various concepts of acids and bases law of chemical equilibrium, Ostwald's dilution law, Ionization of water, pH, common ion effect Buffer solution Henderson's equationSolubility product and its application	
Unit IV: Chemical kinetics and Colloids of Surface Chemistry	**12**
Introduction, types of colloidal system Distinguish between colloids, true solution, and suspension Properties of colloidal solution (Tyndal effect, Brownian movement and Electrophoresis) Adsorption, difference between adsorption & absorptionTypes of adsorptions.	
Unit V: Organic Chemistry:	**12**
Structure, Nomenclature and IUPAC of Alkane, Alkene, Alkyne, Alcohol, Aldehyde, ketone Phenol carboxylic acid and Amines and their reaction Isomerism and types of Isomerism. introduction, IUPAC nomenclature, benzene: resonance, aromaticity, chemical properties: mechanism of electrophilic substitution. Nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation.	

Suggested Reading:

1. Physical Chemistry Vol. 1, 2, 3, 4, K L Kapoor, 6th, Mc Graw, Hill
2. Comprehensive Chemistry XI & XII, Laxmi Publication.
3. Pradeep's New Course Chemistry for Class 11&12 (Vol. 1 & 2), S.C. Kheterpal, S. N. Dhawan,Pradeep, 2020.
4. NCERT Chemistry for Class XI & XII, NCERT, 2018.

Program: BMLT
Semester: I
Course: Remedial Biology
Course Code: **42ABMT004**

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Course Outcome:

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

CO1: Understand fundamental biological concepts related to cell biology, genetics, microbiology, and human physiology that form the basis of medical laboratory practices.

CO2: Understand the structure and function of prokaryotic and eukaryotic cells, including organelles, cell membrane, and mechanisms of transport across membranes.

CO3: Explain basic genetic principles, including DNA/RNA structure, gene expression, inheritance patterns, and mutations relevant to disease diagnostics.

CO4: Demonstrate awareness of biosafety, sterilization, and disinfection principles critical for safe laboratory practices.

CO5: Apply biological principles to understand disease mechanisms and laboratory diagnostic procedures.

Course Content: Remedial Biology

Topics	Hours
Unit 1- Introduction of cell biology and Biomolecules	
Cell biology (structure and functions of cells) Cell organelles: nucleus, mitochondria, ribosomes, etc. Cell division: mitosis and meiosis, cell cycle Biomolecules: carbohydrates, proteins, lipids, nucleic acids Cell membrane and transport mechanisms	**9**
Unit II-Introduction of Microbiology	
Introduction to microorganisms: bacteria, viruses, fungi, protozoa Structure and classification of microbes Sterilization and disinfection methods Culture techniques and microbial growth Pathogenic microorganisms and their impact on human health	**9**
Unit III-Genetics	
DNA structure and function Gene expression and regulation, alleles, Monohybrid, Dihybrid **History of Mendelian genetics in Indian knowledge system (IKS)** Mendelian genetics (laws of inheritance), Phenotype, Genotype, Punnett squares and probability, Pedigree, Gene Mapping, Population genetics, Map distance. Mutations and genetic disorders, Ames Test	**9**
UNIT IV -Immunology	**9**
Innate and adaptive immunity, Immune cell, Organ Antigen presentation and antibody response Immunopathology Cell communication and junction, types of junctions, gap junction, Tight junction	
Unit V-Introduction Laboratory work	
Microscopy techniques: use and care of microscope Observation of prepared slides (blood Sample) Simple staining techniques Identification of biomolecules using basic tests (Benedict's, Biuret, etc.)	**9**

Suggested Readings:

1. Textbook of Biology" by NCERT (for foundational understanding)
2. "Cell Biology" by C.B. Powar and H.F. Bhatt
3. "Essentials of Medical Physiology" by K. Sembulingam

Program: BMLT
Semester: I
Course: Human physiology & Anatomy Lab-1
Course Code: **42ABMT005**

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Course Outcome:

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

CO1: Understand the basics and microscopic studies of anatomy and physiology and relatedorganelles.

CO2: Understand the basics structure, types, divisions and joints of skeletonsystem and its various role.

CO3: Understand and develop the skills about the collection of blood, body fluids,blood components and related challenges that helps in human physiology.

CO4: Understand the anatomy and physiology of respiratory, digestive system,liver and related organelles that help for medical technology.

CO5: Understand about the anatomy of human circulatory system, position,chambers, heart rate and all basic concepts of blood circulation.

Course Content: Human and Physiology Lab-1

Topics	Hours
Unit I- The anatomic and physiological organization of human body	**6**
To study the microscope and its related accessories. To study the permanent slide of animal and plant cells. To measure the own blood pressure by using sphygmomanometer	
Unit II: Skeletal system, bones, joint and muscle	**6**
To study the human skeleton systems by using chart and models. Demonstration of different types bones of the human skeleton systems. Demonstration of division of skeleton system- Appendicular & Axial	
Unit III: The body fluids, blood morphology, chemistry and their function.	**6**
Determination of hemoglobin by using Sahli's method. Estimation of bleeding time of own blood sample. Estimation of clotting time of own blood sample. Estimation of erythrocytes sedimentation rate of own blood sample	
Unit IV: The Respiratory system, digestive system, structure of liver and theirfunction	**6**
To study and draw the structure of Respiratory system by using charts and model. To study and draw the structure of Digestive system by using charts and model. Estimation of Salivary Amylase on different temperature.	
Unit V- Cardiovascular system and its functions	**6**
To study and draw the structure of Cardiovascular system by using charts and model. To study the flow of circulations of cardiovascular system by using chart and models. To study the various types of permanent slide of heart, liver, kidney and lungs.	

Suggested Books & Readings:

S. No.	Title	Author, Publisher, Edition and Year ofpublication
1	Best and Taylor's Physiological Basisof Medical Practice	Best & Taylor's: William & Wilkins, Baltimore
2	Human Anatomy – Regional &Applied	Chaurasia; Part I, II, III, CBS Publishers &Distributors, New Delhi
3	Human Physiology	C.C. Chatterjee; Vols. I & II, Medical Allied Agency,Calcutta

Program: BMLT
Semester: I
Course: Chemistry for MLT Lab
Course Code: 42ABMT006

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

CO1: Acquire skills in quantitative pathological parameters, handling of apparatus frequently used in acidimetry-alkalimetry & redox titrations.

CO2: Understand the quality and importance of water for health & hygiene of humans and animals.

CO3: Learn about characteristic of oil (viscosity.) and determination of pH of buffer solution.

CO4: Understand about the weight related reactions (gravimetry) and calculations used in pathological laboratories.

CO5: Acquire the skills for purification of compounds by crystallization method and qualitative analysis salt.

Course Content: Chemistry for MLT Lab

Topics	Hours
Unit I: Quantitative Analysis	**6**
To find the volume of one drop of water. Preparation of standard solution of Oxalic acid. Preparation of standard solution of Sodium Carbonate. Standardization of Sodium Hydroxide with the help of Oxalic acid Determination of strength of a given solution of Hydrochloric acid by titrating it against standard Sodium Carbonate solution	
Unit II: Water Analysis.	**6**
To determine the Carbonate Hardness of a given sample of water. To determine the Non Carbonate Hardness of a given sample of water To determine the Total Hardness of a given sample of water by EDTA method. To determine the PH of given solution by the colorimetric method. To determine the hydroxyl, carbonate, and bicarbonate alkalinity separately of the given sample of water	
Unit III: Titration related to Redox Reaction and characteristic of oil(viscosity.)	**6**
Estimation of Mohr's salt using standard $KMnO_4$. To determine the strength of a given Potassium dichromate solution with N/20 sodium thiosulphate (Hypo) solution. To determine the viscosity of oil with the help of Redwood Viscosity. To prepare Buffer solution and standardization of pH meter.	
Unit IV: Gravimetric Practical	**6**
To determine the strength of silver ions in a given solution of $AgNO_3$ using chloride ion. Estimation of Barium as Barium Sulphate.	
Unit V: Qualitative Analysis	**6**
Crystallisation of impure sample of any one of the following: Alum, Copper Sulphate, Benzoic acid. Determination of one anion and one cation in a given salt. +Cation- Pb^{2+}, Cu^{2+}, Al^{3+}, Fe^{3+}, Mn^{2+}, Ni^{2+}, Zn^{2+}, Co^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, NH_4 Anion- $(CO_3)^{2-}$, S^{2-} , NO_2^{-2} , SO_3^{-} , SO_4^{2-}, NO_3^{-} , Cl^{-}, Br^{-}, I^{-}, PO_4^{3-} , $C_2O_4^{2-}$, CH_3^{-}	

Suggested Reading:

1. Laboratory Manual on Engineering Chemistry S.K Bhasin, Sudha Rani(Author) Dhanpat Rai Publishing Company (New Edition).
2. The Language of Chemistry or Chemical Equation G.D Tuli & P. L. Son.

Program: BMLT
Semester: I
Subject: Communication and Professional skills
Code: 42ABMT007

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

CO1: Overcoming common communication problems.

CO2: Effectively using non-verbal communication.

CO3: Effectively using digital media to communicate messages.

CO4: Becoming an empathetic listener and inculcating listening skills.

CO5: Inculcating effective communication skills

Course Content: Communication and professional skills

Topics	Hours
Unit I: Vocabulary Building	**9**
The concept of Word Formation Root words from foreign languages and their use in English Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives Synonyms, Antonyms and standard abbreviations Homophones, Homonyms	
Unit II: Basic Writing Skills	**9**
Parts of Speech, Tense, Voice, Narration, Modals, Degree of Comparison, Sentence Structures Use of Phrases and Clauses in sentences Importance of proper Punctuation Creating coherence Organizing principles of paragraphs in documents Techniques for writing precisely	
Unit III: Identifying Common Errors in Writing	**9**
Subject-Verb Agreement Noun-Pronoun Agreement Misplaced Modifiers Articles Prepositions Redundancies Cliches	
Unit IV: Nature and Style of Sensible Writing	**9**
Describing Defining Providing examples or evidence Writing Introduction and Conclusion Paragraph Writing Precis Writing Reading Comprehension	
Unit V: Professional Writing	**9**
Importance of Professional Writing Notice, Memo, Circular, Report Writing, Proposal Writing, Minutes Writing, E- Mail writing Job Application, Difference between Resume, Curriculum Vitae Interview - Types, Importance and Process	

Suggested Readings:

1. High School English Grammar & Composition, Wren & Martins. Chand & Co
2. Practical English Usage, Michael Swan, OUP, 1995
3. Remedial English Grammar F.T. Wood. Macmillan.2007

Semester-II

Program: BMLT
Semester: II
Course: Human Anatomy & Physiology-II
Course Code: 42ABMT009

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

CO 1: Understand the anatomy of urinary system, general properties, abnormal constituents and related diseases found in urine.

CO 2: Understand the anatomy of nervous system, classifications, role of brains and factors affecting nerve impulse that required in medical sciences and technology.

CO 3: Understand the role of glands, secretions of hormones and its mechanism of actionsand also know the importance of lymphatic system, their functions.

CO 4: Understand the anatomy of reproductive system of male and females, hormones involved fertilization, pregnancy, fertility related terms.

CO 5: Understand the nutrition and sense organs, their anatomy, roles in human physiology and challenges to maintain whole mechanism and related studies

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Course Content: Human anatomy & Physiology-II

Topics	Hours
Unit I: Urinary System	**9**
Introduction and anatomy of urinary system Role of kidney, ureters, urinary bladder and urethra Important functions of kidney, sign and symptoms of kidney failure General characteristics of urine and role of nephron Normal composition, abnormal types of urine, abnormal constituents and related diseases	
Unit II: Nervous System	**9**
Introduction of nervous system, classification and functions of nervous system Structure, classification and functions of Neuron Anatomy of brain, role of autonomic nervous system and functions of Brain Synapse and its classification Role of Cerebrospinal fluids (CSF)- composition, circulation, its function and factors that affect neurons and brain	
Unit III: Endocrine and Exocrine glands and functions of Lymphaticsystem	**9**
Introduction of glands Name and function of major human endocrine glands and their hormones Types and mechanism of exocrine glands Introduction of Lymphatic system and their functions Role of lymph, spleen, thymus, mucosa associated lymphatic tissues and related diseases	
Unit IV: Reproductive System	**9**
Introduction to reproductive system Male reproductive system- Primary and Accessory organs and their functions Role of hormones in reproductive system, spermatogenesis, fertilization and related terms Anatomy of female reproductive system and their functions. The menstrual cycle, menopause, ovulation, pregnancy test, fertility, fertilitycontrol, Infertility, combined infertility and related terms.	
Unit V: Sense organs; Eye, Ear, Nose, Tongue and Skin - Structure &theirfunctions	**9**
Nutrition - Carbohydrate, protein, fats and sources of energyAnatomy, structure and function of Eye Anatomical studies, structure and function of Ear Anatomical structure and functions of nose and tongue. Anatomical structure, layer of skin, abnormal skin colors and functions of skin.	

REFERENCE BOOKS:

S. No.	Title	Author, Publisher, Edition and Year of publication
1	Best and Taylor's Physiological Basisof Medical Practice	Best & Taylor's: William & Wilkins, Baltimore
2	Human Anatomy – Regional &Applied	Chaurasia; Part I, II, III, CBS Publishers & Distributors, New Delhi
3	Human Physiology	C.C. Chatterjee; Vols. I & II, Medical Allied Agency, Calcutta
4	Textbook of Medical Physiology	Guyton & Hall; WB Saunders Company
5	Exercise Physiology Laboratory Manual	Adams, Gene; W.C.B. McGraw Hill, New York: 1998

Program: BMLT
Semester: II
Course: Biochemistry-I
Code: **42ABMT010**

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Course Outcome:

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

CO1: To provide knowledge about identifying the structural elements of different biomolecules.

CO2: To demonstrate the role of enzymes in the bio-reactions of a living cell and provideknowledge on the estimation of different enzymes in diagnosing diseases.

CO3: To study the structural, nutritional and diagnostic roles of carbohydrates and their metabolitesin physiological and pathological processes.

CO4: To study the structural, nutritional and diagnostic roles of lipids and their metabolites in physiological and pathological processes.

CO5: To demonstrate the applicability of the metabolic role of proteins, amino acids and nucleic acids in various biological processes.

Course Content: Biochemistry-I

Topics	Hours
Unit I: Introduction Biochemistry	**9**
Introduction to Bio constituents & Metabolism Biochemistry of cell & cell membrane**:** Fluid mosaic model of cell membrane,functions of cell membrane Introduction to Bioenergetics and biological oxidation reduction reactions in living cells Application of Thermodynamics in Biological Reactions Energy Rich Compounds	
Unit II: Enzymes	**9**
Nature, structure and Properties of Enzymes Factors affecting Enzyme Activity, Mechanism of Enzyme Action Nomenclature and Classification of Enzymes. Types of enzymes: Coenzyme,Isoenzymes, Multienzyme Complex Enzyme's kinetics & Inhibition Clinical enzymology -, Therapeutic, Diagnostic & analytical uses of Enzymes with normal value of serum enzymes.	
Unit III: Chemistry and Metabolism of Carbohydrates	**9**
Dietary sources, Digestion & Absorption of carbohydrates carbohydrates of biological importance Metabolism of carbohydrate, Glycolysis, TCA Cycle Glucose Tolerance, Blood Sugar Level, Glycosuria and Diabetes Mellitus, HbA1c Significance and Disorder of Carbohydrate Metabolism.	
Unit IV: Chemistry and Metabolism of Lipids	**9**
Dietary sources, Digestion & Absorption of Lipids Lipids of biological importance, Derived lipid, Sterols, Bile acidsMetabolism of Lipids Lipid profile: Cholesterol, Triglycerides, Lipoproteins, Phospholipids Significance & Disorder of lipid metabolism.	

UnitV: Chemistry and Metabolism of Amino acids and Proteins	**9**
Dietary sources, Digestion & Absorption of Proteins and nucleic acid Characteristics, structure and function of Amino acid and Proteins Biological Value and metabolism of Proteins, formation of Urea, Uric acid,Creatinine Significance & Disorder of Protein metabolism Structure and function of nucleic acid, Types of nucleic acid: DNA and RNA Separation of Protein techniques Electrophoresis, Chromatography, Spectroscopy	

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Editionand Year of publication	ISBN
1	Harper's illustrated Biochemistry	R.K Murray,D.ABender, K.M Botham, P.J Kennelly, V.W.Rodwell& P.A Weil McGrawHill / Medical 31st edition,2018	978-1259837937
2	Lehninger Principles of Biochemistry	David L Nelson, Michael M. Cox W.H. Freeman & Co Ltd8th edition , 2021	978-1319381493
3	Biochemistry	Satyanarayana & U. Chakrapanisevier 6th edition,2021	978-8131264355
4	Fundamentals of Biochemistry	.L. jain, S. Jain, N Jain S. Chand publishing, 7thedition, 2016	978-8121924535

Program: BMLT
Course: Hematology-I
Semester: II
Course Code: 42ABMT011

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Course Outcome:

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

CO 1: Understand the process of hematopoiesis, different types of normal blood cells and givethe identifying characteristics and role of each.

CO 2: Discuss how the hemoglobin, hematocrit, erythrocyte to indices and ESR are used todiagnose.

CO 3: Distinguish between normal and abnormal test results.

CO 4: Distinguish between normal and abnormal test results for the diseases.

CO 5: Discuss how the clinical science of hematology and the complete blood count (CBC) areused in the diagnosis and treatment of disease.

Course Content: Hematology-I

Topics	Hours
Unit I: Introduction to hematology	**9**
Formation of blood Composition and functions of blood. Morphology of normal blood cells and their identification	
Unit-II: Anticoagulants	**9**
Various anticoagulants and their uses Mode of action of anticoagulants Merits and demerits of anticoagulants	
Unit III: Physiological variations	**9**
Various methods of estimation of Hb Procedures of cell counts, visual as well as electronic Procedure of red blood cell count Procedure of white blood cell countProcedure of platelet count	
Unit IV: Hemoglobinometry and Hemocytometry	**9**
Various methods of estimation of Hb Procedures of cell counts, visual as well as electronic Procedure of red blood cell count Procedure of white blood cell countProcedure of platelet count.	
Unit v: **Erythrocyte's sedimentation rate (ESR) and Routine examination of biological fluids**	**9**
Phases of ESR Factors influencing ESR various methods of ESR estimationRoutine examination of urine	

REFRENCES:

S. No.	Title	Author, Publisher, Edition and Yearof publication
1	An introduction to medicallaboratory technology	Baker et al., Seventh Edition, AHodder Arnold Publication.
2	Hematology for medical technologists	Charles F. Seiverd, Fifth Edition.Lea & Febiger, Philadelphia
3	Technical hematology	Arthur Simmons, Third Edition,Lippincott Company.
4	Pathology Practical Book	Harsh Mohan, Fifth RevisedEdition, Jaypee Brothers.

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Program: BMLT
Semester: II
Subject: Histology
Code: 42ABMT012

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

CO1: Understand the significance of various steps to prepare the specimen for histological examination.

CO2: Understand to carry out the fixation process and the mechanism involved.

CO3: Get knowledge of importance of mounting and various types of mountant used.

CO4: Knowledge about various stains used for preparation of specimen shall be attained.

CO5: Acquainted with anatomy of various organs and be capable to distinguish thepresence/absence of pathological conditions.

Course Content: Histology

Topics	Hours
Unit I: Introduction to histology	**9**
Significance of histologyMicro techniques	
Unit II: Fixation	**9**
Methods of Fixation: Physical methods, chemical methods General properties of fixatives Classification of fixatives, choice of fixative.	
Unit III: Mounting	**9**
Mounting Processing, Keeping sections on slides Various mounting media Treatments before staining	
Unit IV: Dyes & Stains	**9**
Dyes Classification and nomenclature, histological staining, metachromasia and metachromatic dyes Staining blood and other cell suspension, connective tissue, nucleic acids, organic functional groups and protein histochemistry Carbohydrate and amyloid special staining procedures and lipid staining. Principles of metal impregnation techniques Demonstration and identification of minerals and pigments.	
Unit V: Histological Studies of Various System	**9**
Circulatory system and alimentary systemDigestive system and respiratory system Urinary system and reproductive system Lymphatic and neurosensory system	

Suggested Books & Readings:

S. No.	Title	Author, Publisher, Edition andYear of publication
1	Histological and HistochemicalMethods Theory and Practice	Kiernan JA, fifth edition, Butter worth & Heinemann Publication.
2	Pathology Practical Book	Harsh Mohan, Fifth RevisedEdition, Jaypee Brothers.

Program: BMLT
Semester: II
Subject: Character building &Holistic development of Personality-I
Code: 42AVAC- 001

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Course Outcome:

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

CO 1: Develop a good understanding of Manomaya Kosha**.**

CO 2: Adapt the concept of constructive roles**.**

CO3: Analyze the understanding of spiritual development**.**

CO4: Correlate the importance of world as a family and enable them to develop Manomaya Kosha, Vijnanamaya Kosha, Anandmaya Kosha.

Course Content: Character building &Holistic development of Personality-I

Topics	Hours
Unit I: Unit I: Cognitive Intellectual Development (Manomaya Kosha)	**15**
Character Building : Meaning, Concept, Constituent elements of character and means/ways of character building. Manomaya Kosha : General Introduction, Meaning and Concept. Manomaya Kosha : Objectives, Characteristics and Significance. Benefits of developed Manomaya Kosha and deficiencies due to underdeveloped Manomaya Kosha.Means, Activities and Programmes to develop Manomaya Kosha	
Unit II: Cognitive Intellectual Development (Vijnanamaya Kosha)	**15**
Vijnanamaya Kosha : General Introduction, Meaning and Concept. Objectives, Characteristics and Significance. Benefits of developed Vijnanamaya Kosha and deficiencies due to underdeveloped Vijnanamaya Kosha.Means, Activities and Programmes to develop Vijnanamaya Kosha	
Unit III: **Cognitive Intellectual Development (Anandamaya Kosha**)	**15**
Anandamaya Kosha : General Introduction, Meaning and Concept. Objectives, Characteristics and Significance. Benefits of developed Anandamaya Kosha and deficiencies due to underdeveloped Anandamaya Kosha. Means, Activities and Programmes to develop Anandamaya Kosha.	
Unit IV: Moral Spiritual Development (To draw inspiration from important events of the lives of great men of India to serve the society and nation	**15**
Social and National Awakening : Chanakya, Birsa Munda, Lala Lajpat Rai, Jyotiba Phule, Adi Shankaracharya, Veer Savarkar, Women from other countries dedicated to India : Annie Besant, Emily Shankle Bose, Mary Reed. Leading Scientists: Acharya Sushruta, Acharya Charak, Aryabhatta, Jagdish Chandra Basu, Homi Jahangir Bhabha, A.P.J Abdul Kalam Women's Awakening : Lakshmi Bai, Rani Durgavati, Rani Chenamma, Rani Ahilya Bai Holkar Those who sacrificed all: Bhagat Singh, Khudiram Bose,	

Chandrashekhar Azad, Mahatma Gandhi.

Seekers of Self-reliant India: Vinoba Bhave, Jai Prakash Narayan, Verghese Kurian, M.S.Swaminathan.

Unique Personality of India: Dr.Rajendra Prasad, Sardar Ballabh Bhai Patel.

REFERENCE BOOKS:

S. No.	Title	Author, Publisher, Edition and Year of publication
1	"Fundamental of Computers"	V. Rajaraman, PHI
2	"Fundamental of Computers"	E. Balagurusamy, Mc Graw Hill

Program: BMLT
Semester: II
Subject: Basics of Forensic Sciences
Code: 42ABMT017

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

CO 1: Understand the Role of Forensic Science explain the scope, importance, and interdisciplinary nature of forensic science in the context of the legal system.

CO2: Apply Basic Forensic Techniques demonstrate knowledge of fundamental forensic procedures, including the collection, preservation, and analysis of physical evidence**.**

CO3: Understand Legal and Ethical Aspects understand the ethical considerations and legal implications involved in forensic investigations and laboratory work.

CO4: Apply relevant laboratory techniques from medical lab technology to forensic applications taxology, Serology, Microscopic.

CO5: Understand in multidisciplinary teams with law enforcement, medical, and forensic experts during investigations.

Course Content: Basics of Forensics Sciences

Topics	Hours
Unit I: Introduction to Forensic Science	**9**
Definition and scope of forensic science History and development of forensic science in India and globally Branches of forensic science (criminalistics, forensic pathology, forensic toxicology, etc.) Role of forensic science in criminal justice system Organizational setup of forensic science laboratories (Central and State Forensic Labs, CFSL, FSL)	
Unit II: Physical Evidence and Its Analysis	**9**
Classification of physical evidence: biological, physical, chemical Methods of collection and preservation of various types of evidence Hair, fibres, glass, soil, fingerprints, blood, saliva, semen, etc. Examination of trace evidence using microscopy and instrumental techniques Fingerprint analysis and its types (loop, whorl, arch)	
Unit III: Legal Aspects and Ethics in Forensics	**9**
Indian Evidence Act and relevant sections of IPC and CrPC Expert witness and court testimony Ethics in forensic science practice Report writing and documentation Recent advances in forensic science	
Unit IV: Forensic Toxicology and Pathology	**9**
Introduction to poisons and toxins: classification and symptoms Routes of administration and collection of samples (urine, blood, stomach contents) Analytical techniques for detecting poisons Post-mortem changes and estimation of time since death Injuries and wounds: types and medico-legal aspects.	
Unit V: Crime Scene Investigation	
Types of crime scenes (indoor, outdoor, mobile) Crime scene management: securing, documentation, collection, preservation Tools and techniques for searching evidence (grid, spiral, strip methods) Chain of custody and legal considerations Photography and sketching of crime scenes	

References:

S. N.	Title	Author, Publisher, Edition andYear of publication
1	Forensic Science: An Introduction to Scientific and Investigative Technique	Stuart H. James, Jon J. Nordby

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Program: BMLT
Semester: II
Course: Human Anatomy & Physiology Lab.- II
Course Code: 42ABMT013

Course Outcome:

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

CO1: Understand the anatomy of urinary system and normal urine samples general properties and related basic routine abnormalities.

CO2: Explain the anatomy of nervous system, role of nerves cell, brain, various types of lobes and its functions that required in medical sciences and technology.

CO3: Understand the role of glands, position and mechanism of secretions of hormones and also know the importance lymphatic system.

CO4: Understand the anatomy of reproductive system of male and females, it's primary and secondary sex organs and various types of process that helps in medical sciences**.**

CO5: Understand the anatomy of sense organs and its mechanism to resolve the various types of challenges.

Course Content: Human anatomy &Physiology Lab-II

Topics	Hours
Unit I: Urinary System	6
To study the anatomy and physiology of urinary system by using chart and models. To determine the pH, Specific gravity and all general characteristics of urine. Microscopic examination of urine sample (Calcium oxalate and Ammonium urate crystals).	
Unit II: Nervous System	6
To study and draw the structure of Nervous system by using charts and model. To study the anatomy of brain and its functions by using models. To routine examination of cerebrospinal fluid and its components	
Unit III: Endocrine and Exocrine glands and functions of Lymphatic system	**6**
To study and draw the structure of various glands by using charts and model. To study the various types of glands, positions and secreting hormones by using chart and models. To study and draw the structure of lymphatic system by using charts and model.	**6**
Unit IV: Reproductive System	
To study and draw the structure of Male reproductive system by using charts and model. To study and draw the structure of female reproductive system by using charts and model. To study the menstrual cycle, menopause, ovulation, pregnancy, fertility and fertility control by using various chart and models.	
UnitV: Sense organs; Eye, Ear, Nose, Tongue and Skin - Structure &their functions	**6**
To study and draw the structure of Skin and its various layers by using charts and model. To study and draw the structure of Eye by using charts and model. To study and draw the structure of Ear by using charts and model. To prepare the health chart schedule for adults and geriatric person. To calculate the values of carbohydrates, proteins and fats in the form of calories for adults.	

REFERENCE BOOKS:

S. No.	Title	Author, Publisher, Edition and Year ofpublication
1	Best and Taylor's Physiological Basisof Medical Practice	Best & Taylor's: William & Wilkins, Baltimore
2	Human Anatomy – Regional &Applied	Chaurasia; Part I, II, III, CBS Publishers & Distributors, New Delhi

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Program: BMLT
Semester: II
Subject: Biochemistry Lab-I
Code: 42ABMT014

Course Outcome:

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

CO1: Understand the Fundamental concepts critical to Analytical procedures in Clinical Chemistry.

CO2: Apply the selected analytical procedures correctly yielding accurate and precise results.

CO3: To Understand between normal and abnormal Clinical Chemistry results.

CO4: Describe basic skills of various Instruments like Centrifuge, Hot air oven etc.

CO5: Discuss basic and contemporary techniques utilized in a Clinical Laboratory testing.

Course Content: Biochemistry Lab-I

Topics	Hours
Unit I: Physical Examination Urine	**6**
Physical examination of Urine Colour & Odour, pH of Urine, Volume, Specific gravity of urine.	
Unit II: Chemical Examination of Urine	**6**
Chemical examination of Urine, Proteinuria, Ketonuria, Glucosuria, Bile salts	
Unit III: Determination of Urea in Blood	**6**
Determination of Urea in Blood, Uric Acid, Protein, Creatinine	
Unit IV: Determination of Chlorides in Urine	
Determination of Chlorides in Urine, Calcium, Phosphate, Ketones	
Unit V: Microscopic Examination of Urine	**6**
Determination of Microscopic structures of Urine, Uric acid crystals, Calcium oxalate crystals, Cholesterol, Triple Phosphate	

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Editionand Year of publication
1	Harper's illustratedBiochemistry	R.K Murray,D.ABender, K.M Botham, P.J Kennelly, V.W.Rodwell& P.A Weil McGrawHill / Medical 31st edition,2018
2	Lehninger Principles of Biochemistry	David L Nelson, Michael M. Cox W.H. Freeman & Co Ltd8th edition , 2021
3	Biochemistry	Satyanarayana & U. Chakrapanisevier 6th edition,2021
4	Fundamentals of Biochemistry	.L. jain, S. Jain, N Jain S. Chand publishing, 7thedition, 2016

Program: BMLT
Semester: II
Subject: Hematology Lab-I
Code: 42ABMT015

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Course Outcome:

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

CO1: Understand the basic concept of haemoglobin estimation by various methods.

CO2: Knowledge of various instruments and procedures related to hemocytometry.

CO3: Mechanism and procedures for ESR estimation using different methods.

CO4: Knowledge of procedures involved in routine examination of various body fluids.

CO5: Concept and significance of bleeding time and clotting time determination.

Course Content: Hematology Lab-I

Topics	Hours
Unit I: Estimation of hemoglobin (Hb) by various methods	**6**
Estimation of Hb by Sahil's method Estimation of Hb by Cyanmethemoglobin method Estimation of Hb by oxyhaemoglobin method Standardization of instruments for adaptation for Hb estimation	
Unit II: Estimation of cell counts by both visual as well as electronic method	**6**
Estimation of white blood cells (leukocytes) counts Estimation of red blood cells (erythrocytes) counts Estimation of platelets (thrombocytes) counts Experiments based on study of morphology of normal blood cells and their identification	
Unit III: Estimation of erythrocytes sedimentation rate (ESR) by various method	**6**
Estimation of erythrocytes sedimentation rate (ESR) by Westergren's method Estimation of Erythrocytes sedimentation rate (ESR) by Wintrobe's method Estimation of erythrocytes sedimentation rate (ESR) by Micro ESR method	
Unit IV: Determination of Chlorides in Urine	**6**
Routine examination of urine Routine examination of cerebrospinal fluid Routine examination of semen	
Unit V: Determination of bleeding time and clotting time by various methods	**6**
Determination of bleeding time by Finger prick method Determination of bleeding time by Dukes method Determination of bleeding time by Ivy's method Determination of clotting time by Capillary tube method Determination of clotting time by Lee and White method	

References:

S. No.	Title	Author, Publisher, Edition and Yearof publication
1	An introduction to medical laboratory technology	Baker et al., Seventh Edition, AHodder Arnold Publication.
2	Hematology for medical technologists	Charles F. Seiverd, Fifth Edition.Lea & Febiger, Philadelphia
3	Technical hematology	Arthur Simmons, Third Edition,Lippincott Company.
4	Pathology Practical Book	Harsh Mohan, Fifth RevisedEdition, Jaypee Brothers.

Program: BMLT
Semester: II
Subject: IT Skill Lab.
Code: 42ABMT016

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

CO1: Student should be acquainted with the Windows GUI, and some simple Windows-based applications.

CO2: Students should be able to work with Microsoft Word and be able to create and edit any document as per requirement.

CO3: Students should be able to work with Microsoft Excel and use its mathematical functions to create a spreadsheet.

CO4: Students should be able to create presentations using Microsoft PowerPoint.

CO5: Students should be familiar with the use of computer in the field of medicine, diagnostics and medical research.

Course Content: IT Lab

Topics	Hours
Unit I:	**6**
Demo of Computer Start-up and Shutdown operations. Demo of Graphical and Command-based user interfaces. Acquaintance with Windows Desktop items. Windows folder hierarchy- Desktop, My Computer, My Documents, Recycle Bin, My Network Places, Windows Accessories- Notepad, Word pad, Paint, Calculator. Content creation and editing. Creating files in any of these applications and Saving itin the desired folder. Windows Explorer- Various file and folder operations- Copying, Moving, Renaming, Delating. Restoring files and folders from Recycle Bin.	
Unit II:	**6**
Microsoft Word- Typing and Editing, Formatting text, Format Painter, Inserting Shapes, Graphics, Text, Equations to Word Document. Document Layout- Page Setup (Margins, Orientation, Page Size), Paragraph Formatting options (Text Alignment, Line Spacing, spacing between paragraphs, Tabs and Indents, Columns), Page breaks, Printing Documents, Converting to PDF. Creating table, Row, Column and Cell operations, Mail Merge.	
Unit III:	**6**
Microsoft Excel- Table and Cell Formatting, Format Painter, Document Layout, Page Breaks, Printing Documents and Converting to PDF. Referencing Cells- Relative, Absolute, Local, 3-D, Remote, Working with Arithmetic Operators and Formula (Mathematical, Text and Date functions).	
Unit IV:	**6**
Logical Function AND, OR, NOT, IF and nested IF Sorting and Filtering. Creating Charts- Column or Bar Chart, Pie Chart, Line Chart.	
Unit V:	**6**
Microsoft PowerPoint- Creating a slide with text, graphics, animation, and other objects. Adding slides to a presentation, Using Animation Effects, Using Slide Transition.	

References:

S. No.	Title	Author, Publisher, Edition and Year of publication
1	Fundamental of Computers	” V. Rajaraman, PHI, **2006**
2	Fundamental of Computers**”**	E. Balagurusamy, Mc Graw Hill, **2006**