

**MRSPTU B.Sc. MEDICAL LABORATORY SCIENCE SYLLABUS 2016 BATCH  
ONWARDS UPDATED ON 20.9.2017**

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**Total Contact Hours = 28**

**Total Marks = 800**

**Total Credits = 24**

SEMESTER 1 <sup>st</sup>		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BMLS1-101	Cell Biology & Human Genetics	4	0	0	40	60	100	4
BMLS1-102	Hematology & Hematological Techniques-I	4	0	0	40	60	100	4
BMLS1-103	Microbiology	4	0	0	40	60	100	4
BMLS1-104	Human Anatomy & Physiology- I	4	0	0	40	60	100	4
BMLS1-105	Basics of Biochemistry	4	0	0	40	60	100	4
BMLS1-106	Microbiology Lab	0	0	4	60	40	100	2
BMLS1-107	Hematology & hematological Techniques- I Lab.	0	0	2	60	40	100	1
BMLS1-108	Basics of Biochemistry Lab.	0	0	2	60	40	100	1
<b>Total</b>		<b>20</b>	<b>0</b>	<b>8</b>	<b>380</b>	<b>420</b>	<b>800</b>	<b>24</b>

**Total Contact Hrs. = 24**

**Total Marks = 700**

**Total Credits= 21**

SEMESTER 2 <sup>nd</sup>		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BMLS1-209	Systematic Bacteriology	4	0	0	40	60	100	4
BMLS1-210	Hematology & Hematological Techniques- II	3	0	0	40	60	100	3
BMLS1-211	Biochemical Metabolism	4	0	0	40	60	100	4
BMLS1-212	Human Anatomy & Physiology- II	4	0	0	40	60	100	4
BMLS1-213	Environmental Sciences	3	0	0	40	60	100	3
BMLS1-214	Systematic Bacteriology Lab.	0	0	4	60	40	100	2
BMLS1-215	Hematology & Hematological Techniques- II Lab.	0	0	2	60	40	100	1
<b>Total</b>		<b>18</b>	<b>0</b>	<b>6</b>	<b>320</b>	<b>380</b>	<b>700</b>	<b>21</b>

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**Total Contact Hrs. = 31**

**Total Marks = 1100**

**Total Credits = 25**

Semester 3 <sup>rd</sup>		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
BMLS1-316	Applied Bacteriology	4	0	0	40	60	100	4
BMLS1-317	Analytical Biochemistry	4	0	0	40	60	100	4
BMLS1-318	Basic Cellular Pathology	4	0	0	40	60	100	4
BMLS1-319	Applied Hematology-I	4	0	0	40	60	100	4
BHUM0-301	Communication Skills	3	0	0	40	60	100	3
BMLS1-320	Applied Bacteriology Lab.	0	0	2	60	40	100	1
BMLS1-321	Analytical Biochemistry Lab.	0	0	2	60	40	100	1
BMLS1-322	Basic Cellular Pathology Lab.	0	0	2	60	40	100	1
BHUM0-302	Communication Skills Lab.	0	0	2	60	40	100	1
BMLS1-323	Applied Hematology-I Lab.	0	0	2	60	40	100	1
BMLS1-324	Seminar	0	0	2	100	0	100	1
<b>Total</b>		<b>19</b>	<b>0</b>	<b>12</b>	<b>600</b>	<b>500</b>	<b>1100</b>	<b>25</b>

**Total Contact Hrs. = 31**

**Total Marks = 1100**

**Total Credits= 25**

Semester 4 <sup>th</sup>		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
BMLS1-425	Immunology & Mycology	4	0	0	40	60	100	4
BMLS1-426	Histopathology- I	4	0	0	40	60	100	4
BMLS1-427	Clinical Biochemistry-I	4	0	0	40	60	100	4
BMLS1-428	Applied Hematology-II	4	0	0	40	60	100	4
BCAP0-401	Fundamentals of Computer	3	0	0	40	60	100	3
BMLS1-429	Immunology & Mycology Lab.	0	0	2	60	40	100	1
BMLS1-430	Histopathology- I Lab.	0	0	2	60	40	100	1
BMLS1-431	Clinical Biochemistry-I Lab.	0	0	2	60	40	100	1
BMLS1-432	Applied Hematology-II Lab.	0	0	2	60	40	100	1
BCAP0-402	Fundamentals of Computer Lab.	0	0	2	60	40	100	1
BMLS1-433	Seminar	0	0	2	100	0	100	1
<b>Total</b>		<b>19</b>	<b>0</b>	<b>12</b>	<b>600</b>	<b>500</b>	<b>1100</b>	<b>25</b>

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**Total Contact Hrs. = 28**

**Total Marks = 1000**

**Total Credits= 23**

Semester 5 <sup>th</sup>		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
BMLS1-534	Parasitology & Virology	4	0	0	40	60	100	4
BMLS1-535	Clinical Biochemistry-II	4	0	0	40	60	100	4
BMLS1-536	Blood Banking	4	0	0	40	60	100	4
BMLS1-537	Medical Lab. Management	3	0	0	40	60	100	3
BHUM0-103	Human Values & Professional Ethics	3	0	0	40	60	100	3
BMLS1-538	Parasitology & Virology Lab.	0	0	2	60	40	100	1
BMLS1-539	Clinical Biochemistry-II Lab.	0	0	2	60	40	100	1
BHUM0-540	Blood Banking Lab.	0	0	2	60	40	100	1
BMLS1-541	Medical Lab. Management Practical	0	0	2	60	40	100	1
BMLS1-542	Seminar	0	0	2	0	100	100	1
<b>Total</b>		<b>18</b>	<b>0</b>	<b>10</b>	<b>440</b>	<b>560</b>	<b>1000</b>	<b>23</b>

Semester 6 <sup>th</sup>		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
BMLS1-643	Professional Training (3 Months)	0	0	6	40	60*	100	7
BMLS1-644	Project/Practical File	0	0	0	0	100	100	5
BMLS1-645	Practical Performance/Viva	0	0	6	0	100	100	5
<b>Total</b>		<b>0</b>	<b>0</b>	<b>12</b>	<b>40</b>	<b>260</b>	<b>300</b>	<b>17</b>

- Marks to be provided by the Health Care Industry where training is provided.

**CELL BIOLOGY & HUMAN GENETICS**

**Subject Code: BMLS1-101**

**L T P C**  
**4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

To make aware the students regarding various cell organelles and their functioning with special stress on human chromosome.

**UNIT-I (9 Hrs.)**

**Cell as a Basic Unit of Living Systems:** Cell Theory. Prokaryotic and Eukaryotic Cell, Eukaryotic Cell – Shape Size, Volume, and Number. Broad Classification of Cell Types: Pplos, Bacteria, Plant and Animal Cells. A Detail Classification of Cell Types within an Organism. Cell, Tissue, Organ and Organisms at Different Levels of Organization

**UNIT-II (11 Hrs.)**

**Structure and Functions of Cell Organelles:** Ultra Structure of Cell Membranes, Cytosol, Golgi bodies, Endoplasmic Reticulum (Rough and Smooth), Ribosome, Cytoskeletal Structure (Actins, Microtubule etc.), Mitochondria, Chloroplasts, Lysosomes, Peroxisomes, and Nucleus (Nuclear Membrane, Nucleoplasm, Nucleolus and Chromatin). Cell Division, Cell Cycle and Cell Growth.

**UNIT-III (12 Hrs.)**

**Nature of Genetic Material:** Nucleic Acids, DNA Replication, Mendelian Laws of Inheritance, Gene Interaction. Sex Determination in Plants and Animals. Sex Linkage, Non-Disjunction as a Proof of Chromosomal Theory of Inheritance. Linkage Mapping of Genes, Interference, Coincidence in Prokaryotes and Eukaryotes.

**UNIT-IV (13 Hrs.)**

**Chromosome:** Chemical Composition: Structural Organization of Chromatids, Centromeres, Chromatin, Telomeres, Nucleosomes, Euchromatin and Heterochromatin. Special Types of Chromosomes (E.G. Polytene and Lampbrush Chromosomes); Mutations; Spontaneous and Induced; Chemical and Physical Mutagens, Banding Patterns in Human Chromosome, Structural and Numerical Changes in Chromosomes, Hereditary Defects. Extra-Chromosomal Inheritance, Sex-Linked Inheritance in Humans, Mutation at Phenotypic Level, Biochemical Level and Molecular Level. Gene Frequencies in Population, Hardy-Weinberg Law.

**Recommended Books**

1. E.D.P. De Robertis., E.M.F. Jr. De Robertis, 'Cell and Molecular Biology', 8<sup>th</sup> Edn., Lea & Febiger Publishers.
2. H.F. Lodish, A. Berk, C.A. Kaiser, M. Krieger, M.P. Scott, 'Molecular Cell Biology', 6<sup>th</sup> Edn., W.H. Freeman & Co.
3. P.K. Gupta, 'Genetics', Rastogi Publications, 2007.
4. R.J. Brooker, 'Genetics Analysis and Principles', Jim Green, 1999

**HEMATOLOGY & HEMATOLOGICAL TECHNIQUES-I**

**Subject Code: BMLS1- 102**

**L T P C**  
**4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

To introduce regarding various components of blood, their functions and techniques for their study.

**UNIT-I (10 Hrs.)**

**Introduction to Hematology:** Definition, Importance, Important Equipment Used, Lab safety and Instrumentation, Blood, its Components Formation (Erythropoiesis, Leucopoiesis, Thrombopoiesis), Composition, Function.

**UNIT-II (9 Hrs.)**

**Anticoagulants, Preservation of Blood:** Various Anticoagulants, Their Uses, Mode of Action, Their Merits and Demerits, Collection and Preservation of Blood for Various Hematological Investigations.

**UNIT-III (15 Hrs.)**

**Hematological Instrumentations:** Clinical Significance, Errors involved in the Haemoglobinometry, Haemocytometry, Procedures for Cell Counts I.E. TLC, DLC, ESR, PCV/Haematocrit Value, Red Cell Indices (RCI), Absolute Eosinophil Count, Reticulocyte Count Platelet Counts (Visual as well as Electronic).

**UNIT-IV (11 Hrs.)**

**Blood Morphology & Staining's:** Morphology of Normal Blood Cells and Their Identifications, Romanowsky's Dyes (Giemsa, Leishman, Wright's, Field's, Jsb)- Principle, Composition, Preparation and Procedure, Preparation of Blood Films- Types, Methods of Preparation), Thick and Thin Smear.

**Recommended Books**

1. K.L. Mukherjee, 'Med. Lab. Technology', Volume-I.
2. Paraful B. Godkar, 'Med. Lab. Technology'.
3. Ramnik Sood, 'Med. Lab. Technology Methods and Interpretation', 5<sup>th</sup> Edn.
4. Christopher A. Ludlam, 'Clinical Hematology'.
5. Ramnik Sood, 'Hematology for Students Practitioners'.
6. Stephen M. Robinson, 'Hematology (Pathophysiological basis for Clinical Practice)'.

**MICROBIOLOGY**

**Subject Code: BMLS1- 103**

**L T P C**  
**4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

To introduce to the students regarding various kinds of microbes in terms of their structure, growth etc. & collection of clinical samples their processing and identification.

**UNIT-I (13 Hrs.)**

**Introduction to Microbiology & Microscopy:** Brief History of Microbiology- Louis Pasteur, Robert Koch, Joseph Lister, Edward Jenner, Characteristics of Bacteria and Fungi, Bright Field, Dark Field, Phase Contrast and Fluorescence and Electron Microscope, Gram, Negative, Spore and Acid- Fast Staining.

**UNIT-II (11 Hrs.)**

**Nutrition and Growth of Bacteria:** Types of Nutritional Requirements, Types and Preparation of Culture Media, Bacteria Cell Division, Growth Phase, Batch and Continuous Culture, Growth of Aerobic and Anaerobic Bacteria.

**UNIT-III (12 Hrs.)**

**Principles and Method of Sterilization:** Physical (Heat, Temperature, Radiation, Filtration) and Chemical Agents (Alcohol, Aldehyde, Halogens, Phenols, Gases) to Control Growth of Microbes.

**UNIT-IV (9 Hrs.)**

**Collection and Transportation of Specimens, Disposal of Laboratory/ Hospital Waste:** General Principles, Collection, Transportation (Urine, Faeces, Sputum, Pus, Body Fluids, Swab and Blood), Non- Infectious Waste, Infected Sharp Waste Disposal, Infected Non- Sharp Waste Disposal.

**Recommended Books**

1. M.J. Jr., Pelczar, E.C.S., Chan and R. Krieg, 'Microbiology', McGraw Hill.
2. G.J. Tortora, B.R. Funke and C.L. Case, 'Microbiology-An Introduction', Benjamin Cummings.
3. B.D. Davis, R. Dulbecco, H.N. Eisen and H.S. Ginsber, 'Microbiology', Harper & Row, Publishers.
4. R.Y. Stainer, J.L. Ingraham, M.L. Wheelis and P.R. Palmer, 'General Microbiology', MacMilan Press Ltd.

**HUMAN ANATOMY & PHYSIOLOGY-I**

**Subject Code: BMLS1-104**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.

**UNIT-I (11 Hrs.)**

**General Anatomy, Cell & Tissue:** Introduction to Anatomical Terms and Organization of the Human Body, Structure, Classification and Function. Cell Division (Mitosis and Meiosis), Tissues Definitions, Types, Characteristics, Classification, Location, Functions and Formation.

**UNIT-II (9 Hrs.)**

**Systemic Anatomy:** Musculoskeletal System: Bones – Types, Structure, Axial & Appendicular Skeleton. Bone Formation and Growth, Joints – Classification and Structure. Role of Ligaments, Cartilages.

**UNIT-III (13 Hrs.)**

**Muscle & Respiratory System:** Structure in Brief, Mechanism of Muscle Contraction, Isotonic and Isometric Contractions, Energy Sources of Muscle Contractions, Motor Unit, Components; Structure, Function and Mechanism of Respiration, Transport of Respiratory Gases, Lung Function Test. Definition of Various Terms Involved in Respiratory System, Methods of Artificial Respiration.

**UNIT-IV (12 Hrs.)**

**Blood, Cardiovascular & Lymphatic System:** Haematocrit, ESR, Blood Volume Measurements. RBC, WBC & Platelet Counts, Developmental Stages and Fate of RBC.

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Functions of RBC, WBC and Platelets. Study of Blood Groups and Coagulation., Anatomy and Physiology of Heart, Cardiac Cycle, Heart Sounds, Definition and Measurements of Cardiac Output, Stroke Volume, ECG – Methods of Recording and ECG Waves. Normal Values of Blood Pressure, Heart Rate and Their Regulation in Brief, Gross and Microscopic Structure of Lymphatic Tissue and Function.

**Recommended Books**

1. Ross and Wilson, 'Anatomy & Physiology'.
2. Clark, 'Anatomy and Physiology: Understanding the Human Body'.
3. Evelyn Pearce, 'Anatomy and Physiology for Nurses'.
4. Sears, 'Anatomy and Physiology for Nurses'.
5. 'Anatomy and Physiology for Nurses', Pearson.

**BASICS OF BIOCHEMISTRY**

**Subject Code: BMLS1-105**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

The main objective of the subject is to impart the knowledge of apparatus, units, equipment's, and volumetric analysis in the laboratory of clinical Biochemistry.

**UNIT-I (11 Hrs.)**

**Introduction to Medical Laboratory Technology:** Study of Medical Laboratory Technologies, Ethics and Ethical Responsibilities, Safety Measures (First Aid and Emergency Treatment).

**UNIT-II (9 Hrs.)**

**Cleaning, Care of Glassware & Equipment, Distilled Water:** Preparation of Washing Reagents and Solutions for Cleaning of Soda Lime and Borosil Glasses, Types of Distilled Water, Preparation and Storage.

**UNIT-III (13 Hrs.)**

**Units of Measurements, Measurements of Volumes and Analytical Balance:** S. I. Units, Measurements of Volume, Volumetric Apparatus (Pipettes, Flasks, Cylinders) and their Calibrations, Principle, Working and Maintenance of Balance.

**UNIT-IV (12 Hrs.)**

**Concept of pH, Standard Solution Preparations, Osmosis:** Definition of pH, Henderson–Hassel Balch Equation, Principle, Working, Maintenance & Calibration of pH Meter, Mole Concept, Molar and Normal Solutions Preparations; Definition of Osmosis, Dialysis, Types of Osmosis, Factor affecting of Osmotic Pressure, Applications of Osmosis & Dialysis.

**Recommended Books**

1. U. Satyanaryna, U. Chkrapani, 'Biochemistry', 4<sup>th</sup> Edn., Elsevier.
2. D.L. Nelson, L.A. Lehninger, M. Cox, M., Lehninger 'Principles of Biochemistry', 5<sup>th</sup> Edn., W.H. Freeman.
3. P.B. Godkar and D.P. Godkar, 'Text Book of Medical Laboratory Technology', Vol. 1 and 2, 3<sup>rd</sup> Edn., Bhalani.
4. M.K. Sateesh, 'Bioethics and Biosafety', I.K. International Pvt. Ltd.
5. K. Wilson and J. Walker, 'Principles and Techniques of Biochemistry and Molecular Biology', 7<sup>th</sup> Edn., Cambridge University Press.
6. D.T. Plummer, 'An Introduction to Practical Biochemistry', 3<sup>rd</sup> Edn., Tata McGraw Hill,
7. J.B. Yadav, 'Practical Physical Chemistry', Krishn's Educational Publishers.



**MICROBIOLOGY LAB.**

**Subject Code: BMLS1-106**

**L T P C**  
**0 0 4 2**

**EXPERIMENTS**

1. Introduction to Use of Different Laboratory Instruments and Their Safety Precautions.
2. To Demonstrate the Working & Handling of Compound Microscope.
3. Washing, Cleaning and Sterilization Glassware.
4. Media Preparation and Sterilization.
5. To Prepare Working Dilution of Commonly Used Disinfectants.
6. To Demonstrate Aerobic Culture.
7. To Demonstrate of Anaerobic Culture.

**Recommended Books**

1. G. James, G. Cappuccino and Natalie Sherman, 'Microbiology: A Laboratory Manual', Benjamin Cummings.
2. K.R. Aneja, 'Experiments in Microbiology, Plant Pathology and Biotechnology', New Age Publishers.

**HEMATOLOGY & HEMATOLOGICAL TECHNIQUES- I LAB.**

**Subject Code: BMLS1-107**

**L T P C**  
**0 0 2 1**

**EXPERIMENTS**

1. Demonstration of equipment used in clinical field: Microscope, Blood cell, counter, Sahil's apparatus, calorimeter.
2. Hb Estimation: Sahil's methods, Cyanmethaemoglobin, Oxyhaemoglobin methods.
3. TLC, DLC, platelet and Reticulocyte, Absolute Eosinophil counts.
4. Preparation of smear and staining with Giemsa and Leishman stain.
5. Calculation of Red Cell Indices (RCI).
6. Packed cell volume (Macro and Micro methods).
7. ESR (Wintrobe and Westergren methods).

**Recommended Books**

1. K.L. Mukherjee, 'Med. Lab. Technology', Volume-I.
2. Paraful B. Godkar, 'Lab. Technology'.
3. Ramnik Sood, 'Med. Lab. Technology Methods and Interpretation', 5<sup>th</sup> Edn.
4. Christopher A. Ludlam, 'Clinical Hematology'.
5. Ramnik Sood, 'Hematology for Students Practitioners'.
6. Stephen M. Robinson, 'Hematology (Pathophysiological Basis for Clinical Practice)'.

**BASICS OF BIOCHEMISTRY LAB.**

**Subject Code: BSMLT-108**

**L T P C**  
**0 0 2 1**

1. Methods of Cleaning of the Laboratory Glassware.
2. Distillation of The Water.



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3. Principle, Working & Maintenance of pH Meter.
4. Principle, Working & Maintenance Analytical Weighing Balance.
5. To Prepare 0.1N NaOH Solution
6. To Prepare 0.2N HCl Solution.
7. To Prepare 0.2N H<sub>2</sub>SO<sub>4</sub> and 0.2M Na<sub>2</sub>CO<sub>3</sub> Solution.
8. Demonstration of Osmosis and Dialysis.

**Recommended Books**

1. P.B. Godkar and D.P. Godkar 'Text Book of Medical Laboratory Technology', volume 1 & 2, 3<sup>rd</sup> Edn., Bhalani.
2. D.T. Plummer, 'An Introduction to Practical Biochemistry', 3<sup>rd</sup> Edn., Tata McGraw Hill.
3. K. Wilson, J. Walker, 'Principles and Techniques of Biochemistry and Molecular Biology', 7<sup>th</sup> Edn., Cambridge University Press.
4. J.B. Yadav, 'Practical Physical Chemistry', Krishna's Educational Publishers.

**SYSTEMATIC BACTERIOLOGY**

**Subject Code: BMLS1-209**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

Students will learn the morphology, cultural characteristics, biochemical characteristics & laboratory diagnosis of various bacteria.

**UNIT-I (5 Hrs.)**

**Staining Techniques in Bacteriology: Principle, Procedures and Interpretation:** Simple, Negative, Gram, Albert's, Ziehl-Nelsen, Capsule, Flagella and Spore stainings.

**UNIT-II (16 Hrs.)**

**Biochemical Tests for the Identification of Different Bacteria:** Catalase, Coagulase, Indole, Methyl Red, Voges Proskauer, Urease, Citrate, Oxidase, TSIA, Nitrate reduction, Carbohydrate fermentation, H<sub>2</sub>S production, Decarboxylases, CAMP.

**UNIT-III (10 Hrs.)**

**Morphology, Culture Characteristics, Pathogenesis and Laboratory Diagnosis of the Gram Positive Bacteria:** Staphylococci, Streptococci, Corynebacteria, Mycobacteria, Clostridium.

**UNIT-IV (14 Hrs.)**

**Morphology, Culture Characteristics, Pathogenesis and Laboratory Diagnosis of the Gram Negative Bacteria:** Pseudomonas, Enterobacteriaceae: Escherichia, Klebsiella, Citrobacter, Enterobacter, Proteus, Salmonella, Shigella, Yersinia; Neisseria, Vibrio, Mycoplasma, Rickettsia & Chlamydia.

**Recommended Books**

1. James G. Cappuccino and Natalie Sherman, 'Microbiology: A Laboratory Manual', Benjamin Cummings.
2. K.R. Aneja, 'Experiments in Microbiology, Plant Pathology and Biotechnology', New Age Publishers.
3. M. Cheesbrough, 'District Laboratory Practice in Tropical Countries', Cambridge University Press.
4. R. Ananthanarayan, C.K.J. Panikar, 'Textbook of Microbiology', 6<sup>th</sup> Edn., Orient Longman Private Limited.

**HEMATOLOGY & HEMATOLOGICAL TECHNIQUES-II**

**Subject Code: BMLS1-210**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**Course Objectives**

To understand the detailed aspects of blood and its coagulation behaviour.

**UNIT-I (6 Hrs.)**

**Blood Group Systems:** History and discovery of blood group system; ABO and Rhesus blood group system; Compatibility tests in blood transfusion, complications and hazards of blood transfusion.

**UNIT-II (8 Hrs.)**

**Hemoglobin Studies:** Hemoglobin, its synthesis, functions and degradation; Hemoglobin, pigments and their measurements; Abnormal hemoglobin's, their identification and estimation.

**UNIT-III (10 Hrs.)**

**Blood Coagulation:** Hemostatic mechanism and theories of blood coagulation; Classification and physio- chemical properties of coagulation factors.

**UNIT-IV (12 Hrs.)**

**Blood Coagulation Reagents and Procedures:** Preparation and standardization of various coagulation; Screening coagulation procedures such as Bleeding and clotting time, Hess test, prothrombin time (PT) and Activated Partial Thromboplastin time (APTT).

**Recommended Books**

1. Paraful B. Godkur, 'Text Book of Med. Lab. Technology'.
2. V.H. Talib, 'Hand Book of Med. Lab. Technology', 2<sup>nd</sup> Edn.
3. J.B. Dacie, 'Med. Lab. Tech. Methods and Interpretation, Practical Hematology'.
4. Christopher A. Ludlam, 'Clinical Haematology'.
5. G.A. McDonald, 'Atlas of Hematology'.
6. Stephen M. Robinson, Hematology (Pathophysiological basis for clinical practice 3<sup>rd</sup> Edn.).

**BIOCHEMICAL METABOLISM**

**Subject Code: BMLS1-211**

**L T P C**  
**4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives:** To introduce the students regarding various pathways of metabolism of carbohydrates, lipids, proteins, amino acids and to relate these with body functions.

**UNIT-I (12 Hrs.)**

**Carbohydrates:** Outline of Glycolysis, TCA, and Gluconeogenesis, Glycogen metabolism (glycogenesis, glycogenolysis, glycogen storage diseases, and hormone regulation), biomedical importance of HMP, GTT and its regulation.

**UNIT-II (11 Hrs.)**

**Lipids:**  $\beta$  fatty acid oxidation along with inborn errors, fatty acid synthesis, Cholesterol synthesis, catabolism & regulation, brief about atherosclerosis, Lipoproteins, ketosis, lipid peroxidation and role of antioxidants.

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**UNIT-III (13 Hrs.)**

**Amino Acids:** Oxidative and nonoxidative deamination, transmission and decarboxylation, transamidation, transport and function of ammonia, urea cycle, metabolism of specialized products like glycine, phenylalanine, tyrosine, tryptophan, methionine, cysteine, histidine and branched chain amino acids, creatine metabolism.

**UNIT-IV (9 Hrs.)**

**Nucleic acids, Enzymes and Vitamins:** Types of nucleic acids, functions, importance of nucleosides and nucleotides, properties and classification of enzymes, Factor affecting the enzymes activity, applications of enzymes, concept of water soluble & fat soluble vitamins.

**Recommended Books**

1. U. Satyanaryana, U. Chkrapani, 'Biochemistry', 4<sup>th</sup> Edn., Elsevier.
2. D.L. Nelson, L.A. Lininger, M. Cox, M., Lehninger, 'Principles of Biochemistry', 5<sup>th</sup> Edn., W.H. Freeman.
3. J.M. Berg, J.L. Tymoczko, L. Stryer, 'Biochemistry', 5<sup>th</sup> Edn., W.H. Freeman.
4. D. Voet, J.G. Voet, 'Biochemistry', 4<sup>th</sup> Edn., John Wiley & Sons.

**HUMAN ANATOMY & PHYSIOLOGY- II**

**Subject Code: BMLS1-212**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

Students will be able to learn the terminology of the subject and basic knowledge of the cell structure and function of organs, organ systems and body fluids in normal human body.

**UNIT-I (11 Hrs.)**

**Body Fluids:** Important terms, types of body fluid, total body water, avenues by which water leaves and enters body, general principles for fluid balance, cardinal principle, how body fluids maintain Homeostasis, Electrolytes & ions Function of electrolytes, how electrolyte imbalance leads to fluid imbalance

**UNIT-II (9 Hrs.)**

**Digestive System:** Structure & Function (Mouth, Tongue, Teeth, Oesophagus, Pharynx, Stomach, Intestine, Rectum, Anus; Digestive glands; physiology of digestion of carbohydrates, lipids & proteins, Structure and function of liver.

**UNIT-III (13 Hrs.)**

**Genitourinary System:** Structure & function of kidney; structure of Nephron; physiology of excretion & mechanism of urine formation; renal function test Structure and Gametogenesis of male and female reproductive system; menstrual cycle

**UNIT-IV (12 Hrs.)**

**Nervous & Endocrine System:** Structure of neuron, nerve impulse; structure & function of brain & spinal cord, Spinal & Cranial nerves; all & none principal, role of neurotransmitters in transmission of nerve impulse, Structure & Functions of different types of glands, their location, secretions and metabolic disorders

**Recommended Books**

1. Ross and Wilson, 'Anatomy & Physiology.
2. Clark, 'Anatomy and Physiology: Understanding the Human Body'.
3. Pearce, 'Human Anatomy for Nurses'.

**ENVIRONMENTAL SCIENCES**

**Subject Code: BMLS1-213**

**L T P C  
3 0 0 3**

**Duration: 36 Hrs.**

**Course Objectives**

To impart knowledge concerned with those aspects of human behaviour which are more directly related to man's interaction with bio- physical environment and ability to understand the pollution and environmental degradation.

**UNIT-I (10 Hrs.)**

**Ecosystem Inter- relationship:** Basic concepts, components of ecosystem, Trophic levels, food chains and food webs, Ecological pyramids, ecosystem functions, Energy flow in ecological systems, energy efficiencies, Importance of gaseous and sedimentary cycles; Carbon, Nitrogen, Phosphorus and Sulphur Cycles, Global Oxygen Cycles, Hydrological cycles.

**UNIT-II (8 Hrs.)**

**Natural Resources & Sustainable Management:** Water resources; Surface water and ground water, watershed management, water harvesting, Land resources; Land use pattern, eco generation of wastelands, soil erosion and conservation, soil reclamation, The concept of sustainable development; Environmental degradation and conservation issue; Global change and sustainability issues.

**UNIT-III (8 Hrs.)**

**Environmental Pollution:** Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management; Causes, effects and control measure of urban and industrial wastes.

**UNIT-IV (10 Hrs.)**

**Environmental Health Science & Toxicology:** Concept of toxins, toxicity and toxicology, Classification of toxic compounds, Dose effect and Dose response relationship, levels of toxicity – acute, sub-acute and chronic, Types of toxicants, classification of toxicants – factors that affect environmental concentration of toxicants, Chemical and biological factors influencing toxicity, physiological responses of man to relevant stresses in the environment, industrial toxicology and its relationship with occupation and hygiene and also diseases.

**Recommended Books**

1. D.B. Botkin and E.A. Keller, 'Environment Science: Earth as a Living Planet', 3<sup>rd</sup> Edn., John Wiley and Sons Inc.
2. D.K. Asthana, M. Asthana, 'A Text Book of Environmental Studies', S. Chand & Co., 2006.
3. L.G. Cockerham and B.S. Shane, 'Basic Environmental Toxicology', CRC Press, Bocaaton, USA.
4. J.P. Shukla and Pandey, 'Elements of Toxicology', Radha Publications, New Delhi.
5. I. Sethi, 'Environmental Pollution Causes, Effects & Control', Neha Publishers & Distributors.

**SYSTEMATIC BACTERIOLOGY LAB.**

**Subject Code: BMLS1-214**

**L T P C**

**0 0 4 2**

**EXPERIMENTS**

**1. Demonstration of Staining Procedures: Simple Stain**

- a) Negative stain
- b) Gram stain
- c) Albert's stain
- d) Ziehl-Nelsen stain
- e) Capsule stain
- f) Flagella stain
- g) Spore stain

**2. Demonstration of Biochemical Test: Catalase**

- a) Coagulase
- b) Indole
- c) Methyl Red
- d) Voges Proskauer
- e) Urease
- f) Citrate
- g) Oxidase
- h) TSIA
- i) Nitrate reduction
- j) Carbohydrate fermentation
- k) H<sub>2</sub>S production
- l) Decarboxylases
- m) CAMP

3. Morphology, culture characteristics of commonly bacterial isolates: Escherichia coli, Enterobacter aerogenes, Staphylococcus aureus, Klebsiella pneumoniae, vibrio.

**Recommended Books**

1. James G. Cappuccino and Natalie Sherman, 'Microbiology: A Laboratory Manual', Benjamin Cummings.
2. K.R. Aneja, 'Experiments in Microbiology, Plant Pathology and Biotechnology', New Age Publishers.
3. M. Cheesbrough, 'District Laboratory Practice in Tropical Countries', Cambridge University Press.
4. J.G. Collee, A.G. Fraser, B.P. Marimon, A. Simmons, 'Mackie & McCartney Practical Medical Microbiology', 4<sup>th</sup> Edn., Churchill Livingstone.

**HEMATOLOGY & HEMATOLOGICAL TECHNIQUES- II LAB.**

**Subject Code: BMLS1-215**

**L T P C**

**0 0 2 1**

**EXPERIMENTS**

1. To measure the levels of Met, Carboxy and Sulpha-haemoglobin

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2. To determine PT, PTI, INR and APTT of the given sample
3. To determine platelet, count of the given sample using phase contrast microscope
4. To prepare the following in lab: Thromboplastin, Cephalin, Thrombin, M/uo Calc2 and Kaolin solution.

**Recommended Books**

1. Paraful B. Godkur, 'Text Book of Med. Lab. Technology'.
2. V.H. Talib, 'Hand Book of Med. Lab. Technology', 2<sup>nd</sup> Edn.
3. J.B. Dacie, 'Med. Lab. Tech. Methods and Interpretation', Practical Haematology.
4. Christopher A. Ludlam, 'Clinical Hematology'.
5. G.A. McDonald, 'Atlas of Hematology'.
6. Stephen M. Robinson, 'Hematology' (Pathophysiological basis for Clinical Practice) 3<sup>rd</sup> Edn.

**APPLIED BACTERIOLOGY**

**Subject Code: BMLS1- 316**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

1. The student will understand the role of bacteria in different applications that directly or indirectly affect the human's life.

**UNIT- I (12 Hrs.)**

**Sample Collection, Transportation and Processing:** Upper and lower respiratory tract; gastro intestinal tract infections; urinary tract infections; genital tract infections; Septicemia and bacteraemia.

**UNIT- II (9 Hrs.)**

**Examination of Water, Milk & Food Product:** Presumptive coliform count (Eijkman test), Membrane filtration tests of water; various tests for Bacteriological quality of milk and its product; classification of food like frozen food, canned food, raw food, cooked food, Bacteriological examination with special reference to food poisoning bacteria.

**UNIT- III (10 Hrs.)**

**Examination of Air, Nosocomial Infection & Epidemiological Markers:** Significance of air bacteriology in healthcare facilities, types of air sampling methods, collection processing and reporting of an air sample; sources and types of nosocomial infections, Role of microbiology laboratory in control of nosocomial infections; Serotyping and phage typing.

**UNIT- IV (14 Hrs.)**

**Microbial Preservation & Antibiotic Susceptibility Testing:** Basic concepts of preservation of microbes, Principle and procedures of various preservation methods with special reference to lyophilization; Definition of antibiotics, Preparation and standardization of inoculums, Choice of antibiotics, MIC and MBC determination, Stokes method and Kirby-Bauer method; test for production of  $\beta$ - lactamase.

**Recommended Books**

1. Mackie & MacCartney, 'Practical Medical Microbiology', Vol. 1 and 2.
2. Ananthanereyan, 'Text book of Microbiology'.
3. Paniker & Satish Gupte, 'Medical Microbiology'.
4. Mukherjee, 'Medical Laboratory Technology', Vol. I, II, III.
5. Monia Cheesbrough, 'Medical Laboratory Manual for Tropical Countries', Vol. II.
6. V. Muralidhar, 'Hospital Acquired Infections'.



**ANALYTICAL BIOCHEMISTRY**

**Subject Code: BMLS1 - 317**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

1. Student will know about the various techniques used in the biochemistry laboratories for the detection of the diseases and disorders.

**UNIT- I (12 Hrs.)**

**Spectrophotometry & Colorimetry:** Theories of spectrophotometry and colorimetry; Lambert's law and Beer's law; Construction and working of spectrophotometry and colorimetry and their clinical applications.

**UNIT- II (9 Hrs.)**

**Photometry:** Introduction, Principle of Flame photometry; body construction, working; clinical applications and limitations.

**UNIT- III (14 Hrs.)**

**Chromatography:** Types of chromatography: Paper, Thin Layer, Column, Gas, Ion exchange, Gel; their principles, working and applications.

**UNIT- IV (10 Hrs.)**

**Electrophoresis:** Introduction, principle, Instrumentation; types of electrophoresis: paper and gel electrophoresis and their applications.

**Recommended Books**

1. Harold Varley, 'Practical Clinical Biochemistry'.
2. K. Wilson and J. Walker, 'Principles and Techniques of Biochemistry and Molecular Biology', Cambridge University Press.
3. P.B. Godker, 'Text book of Medical Laboratory Technology'.
4. Mukherjee, 'Medical Laboratory Technology'.
5. Chatwal Anand, 'Instrumental Analysis'.
6. Shinde Chaterjee, 'Text book of Medical Biochemistry'.

**BASIC CELLULAR PATHOLOGY**

**Subject Code: BMLS1-318**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

1. The student will learn about the diseases associated with different body organs and systems.

**UNIT- I (12 Hrs.)**

**Digestive & Accessory System Complications:** Diseases: mouth, oesophagus, gastritis, peptic ulceration, intestinal abstrictions; Microbial complications: Food poisoning, malabsorption, hepatitis, appendicitis; liver cirrhosis, pancreatitis, jaundice.

**UNIT- II (10 Hrs.)**

**Respiratory System Problems:** Upper respiratory tract infections: Bronchi, Asthma; Lower respiratory Infections: Pneumonia, Lung abscess, Tuberculosis, Lung Collapse.



**UNIT- III (13 Hrs.)**

**Urinary & Reproductive System Problems:** Glomerulonephritis, Nephrotic syndrome, Renal failure, Renal calculi, Urinary obstruction, Urinary tract infection; Sexually transmitted diseases, Disease of ovaries, ectopic pregnancy, prostatitis, Infertility.

**UNIT- IV (10 Hrs.)**

**Circulatory System Complications:** Disease of the blood vessels: Atheroma, Arteriosclerosis, heart block; blood pressure: hyper and hypotension.

**Recommended Books**

1. Ross and Wilson, 'Anatomy & Physiology'.
2. Pearce, 'Human Anatomy and Physiology'.
3. Di Fiore, 'Atlas of Histology'.
4. 'Medical Laboratory Technology' Vol. III.
5. 'Color Atlas of Basic Histopathology'.

**APPLIED HAEMATOLOGY- I**

**Subject Code: BMLS1-319**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

The students are made aware of Safety precautions, Quality assurance, biomedical waste management and automation in haematology.

**UNIT- I (12 Hrs.)**

**Quality Assurance & Safety Precautions in Haematology:** Internal and external quality control, routine quality assurance protocol; statistical analysis: Standard deviation, Co-efficient variation, accuracy and precision; standard guidelines related to safety precautions.

**UNIT- II (10 Hrs.)**

**Bone Marrow Examination:** Composition and function of bone marrow; aspiration procedure and processing of bone marrow; processing and staining of trephine biopsy specimens.

**UNIT- III (10 Hrs.)**

**Blood Cells Anomalies:** Red Blood Cells: Morphological changes such as variation in size shape & staining character; Leucocytes: Abnormal morphology i.e. shift to left & shift to right.

**UNIT- IV (13 Hrs.)**

**Biomedical Examinations & Biomedical Waste Management:** Routine examination of Urine, seminal fluid, CSF and other body fluids; biomedical waste classification and segregation; treatment procedure.

**Recommended Books**

1. Paraful B. Godkar, 'Text book of Medical Laboratory Technology'.
2. J. B. Dacie, 'Practical Haematology'
3. V.H. Talib, 'Hand book of Medical Laboratory Technology'.
4. Emmanuel C.Besa, 'Haematology' (International Edition) Harwal Publisher.
5. Sir John, 'Practical Haematology' 8<sup>th</sup> Edn.
6. Christopher A. Ludlam, 'Clinical Haematology'.
7. John Bernard Henary, 'Clinical Diagnosis & Management by Laboratory Methods'.
8. Ramnik Sood, 'Medical Laboratory Technology Methods & Interpretation'.

**COMMUNICATION SKILLS**

**Subject Code: BHUM0-301**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**Course Objectives**

The objective of this course is to make students understand that both oral & written communication is equally important.

**UNIT- I (8 Hrs.)**

**Basics of Technical Communication:** Meaning, Internal & External functions, Shannon & Weaver's model of Communication, Importance of Communication Barriers to communication & ways to improve these barriers, Essentials (7c's & other principles)

**UNIT- II (8 Hrs.)**

**Writing Skills:** Writing styles of applications, resume & CV, Personal letters, Official/Business letters, Memo, Notice, Report writing, Project writing, Quotation & Tender.

**UNIT- III (12 Hrs.)**

**Speaking Skills:** Presentation Techniques, Principles of Presentation, Types of Interview, G.D, Extempore speaking, Speech Mechanism, Organs of speech, Production & Classification of Speech sounds, skills of effective speaking.

**UNIT- IV (8 Hrs.)**

**Tech Communication & Listening Skills:** MS Word, Excel, PowerPoint, Process, Types of listening, Barriers to effective listening, Barriers to effective listening & ways to improve these Barriers.

**Recommended Books**

1. Loveleen Kaur, 'Communication Skills' Satya Prakashan Publication.
2. Narinder Kumar Bodhraj, 'Business Communication', Kalyani Publishers, 2011.
3. S.P. Dhanavel, 'English & communication Skills for the Students of Science & Engineering' Orient blackswan publication, 2009.
4. Indrajit Bhattacharya, 'An Approach to Communication Skills'.
5. Chissie Wright, 'Handbook of Practical Communication Skills'.

**APPLIED BACTERIOLOGY LAB.**

**Subject Code: BMLS1 - 320**

**L T P C**  
**0 0 4 2**

**EXPERIMENTS**

1. Isolation of pure cultures by spread plate, pour plate and streak plate method.
2. Culturing of blood, urine, throat swab, csf and other body fluids.
3. Microbiological examination of water by MPN
4. Microbiological examination of milk by MBRT.
5. To perform antibiotic susceptibility testing of clinical isolates by using Stokes and Kirby-Bauer method.
6.  $\beta$ - lactamase production test.

**Recommended Books**

1. James G. Cappuccino and Natalie Sherman, 'Microbiology: A Laboratory Manual, Benjamin Cummings'.

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2. K.R. Aneja, 'Experiments in Microbiology, Plant Pathology and Biotechnology', New Age Publishers.

**ANALYTICAL BIOCHEMISTRY LABORATORY**

**Subject Code: BMLS1 - 321**

**L T P C**

**Duration: 24 Hrs.**

**0 0 2 1**

**EXPERIMENTS**

1. Working & maintenance of spectrophotometer.
2. To demonstrate the working & maintenance of colorimeter.
3. To demonstrate the working & maintenance of flame photometer.
4. To demonstrate the procedure of paper chromatography.
5. To demonstrate the procedure of Gas chromatography.
6. Demonstration of TLC.
7. To demonstrate the procedure of column chromatography.
8. Electrophoresis of the given DNA sample.

**Recommended Books**

1. K. Wilson and J. Walker, 'Principles and Techniques of Biochemistry and Molecular Biology' Cambridge University Press.
2. A. Pingoud, C. Urbanke and A. Jeltsch, 'Biochemical Methods', John Wiley.

**BASIC CELLULAR PATHOLOGY LAB.**

**Subject Code: BMLS1 - 322**

**L T P C**

**0 0 2 1**

1. To study squamous cell from cheek cells.
2. To study stained slide preparation from organs of digestive system.
3. Study of stained slides of liver, pancreas, gall bladder.
4. To study stained slide preparation from organs of circulatory system.
5. To study stained slide preparation from organs of Respiratory system.
6. To study stained slide preparation from organs of Urinary system.

**Recommended Books**

1. Medical Laboratory Technology-Vol. III.
2. Color atlas of basic Histopathology.

**COMMUNICATION SKILLS LAB.**

**Subject Code: HUM0-302**

**L T P C**

**0 0 2 1**

1. To study propose text book.
2. Precise writing and simple passage from a prescribed text books. At least 100 words should be chosen and few questions from the passage may be said to answer.
3. To practice all forms communication i.e. drafting report, agenda notes, précis writing, telegram, circular, representations, press release, telephonic communication, practice of writing resume and writing application of employment.

**Recommended Books**

1. S.P. Dhanavel, 'English & Communication Skills for the Students of Science & Engineering', Orient Blackswan Publication, 2009.
2. Indrajit Bhattacharya, 'An Approach to Communication Skills'.
3. Chissie Wright, 'Handbook of Practical Communication Skills'.

**APPLIED HAEMATOLOGY- I LAB.**

**Subject Code: BMLS1- 323**

**L T P C**

**0 0 2 1**

**EXPERIMENTS**

1. To prepare a bone marrow smear and stain by Leishman's, May Grunwald Giesma and Perl's stain.
2. To study the RBCs abnormal morphological forms.
3. Physical, Chemical and Microscopic examination of urine.
4. Cytological examination of CSF and other body fluids.
5. Physical and Microscopic examination of seminal fluid including sperm Count.

**Recommended Books**

1. J.B. Dacie, 'Practical Haematology'.
2. V.H. Talib, 'Hand Book of Medical Laboratory Technology'.
3. Emmanuel C. Besa, 'Haematology', Harwal Publisher.
4. Sir John, 'Practical Haematology'.

**IMMUNOLOGY & MYCOLOGY**

**Subject Code: BMLS1-425**

**L T P C**

**4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

1. To teach the concepts of immunological mechanisms.
2. To teach medically important fungi and diagnosis of their diseases.

**UNIT- I (12 Hrs.)**

**Introduction to Immunology & Its Techniques:** Innate and acquired immunity including basic concepts about their mechanisms; types of antigens and Determinants of antigenicity; structure and properties of immunoglobulins; complement system; humoral and cellular immune response; principles, procedure and applications of Complement fixation test, Immunofluorescence, ELISA, CCIEP, and RIA, SDS-PAGE and western blotting, agglutination tests.

**UNIT- II (10 Hrs.)**

**Hypersensitivity, autoimmunity & Vaccine:** Definition and types of hypersensitivity reactions; Basic concepts of autoimmunity and brief knowledge about autoimmune diseases; Types of vaccine, schedule and brief knowledge about '*Extended programme of immunization*' (EPI) in India.

**UNIT- III (09 Hrs.)**

**Introduction to Medical Mycology:** Basic concepts about superficial and deep Mycoses, Taxonomy and classification and general characteristics of various medically important fungi, Normal fungal flora.

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**UNIT- IV (14 Hrs.)**

**Laboratory Procedures:** Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids; Direct microscopy; Culture media used in mycology; Techniques used for isolation and identification of medically important fungi; Use of laboratory animal for diagnosis of fungal infections; Preservation of fungal cultures.

**Recommended Books**

1. Ivan Roitt, Jonathaan Brostoff and David Male, 'Immunology'.
2. Kuby, 'Immunology'.
3. Dr Jagdish Chander, 'Medical Mycology'.
4. Paniker & Satish Gupte, 'Medical Microbiology'.
5. Mackie & MacCartney, 'Practical Medical Microbiology' Vol. 1 and 2.

**HISTOPATHOLOGY - I**

**Subject Code: BMLS1- 426**

**L T P C**  
**4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

Student will learn about the various techniques used in the histopathology.

**UNIT-I (09 Hrs.)**

**Basic Concepts of Histopathology and Methods of Tissues Examination:** Introduction to histopathology: Safety measures in a histopathology laboratory, Care and maintenance of laboratory equipment used, Collection and transportation of specimens, various types of fixatives used in a routine histopathology laboratory.

**UNIT-II (14 Hrs.)**

**Decalcification & Embedding:** Criteria of a good decalcification agent; Technique of decalcification with selection of tissue, fixation, decalcification, neutralization of acid and thorough washing; various types of decalcifying fluids. Types of embedding media; Procedure followed by Dehydration, Clearing, Infiltration and routine timing schedule for manual or automatic tissue; Components & principles of various types of automatic tissue processors.

**UNIT- III (10 Hrs.)**

**Section Cutting:** Equipment used for sectioning: Microtome Knives, Sharpening of Microtome Knives, Honing, Stropping, Freezing Microtome, Cryostats; Faults in paraffin section cutting with reasons and remedies, spreading the sections and attachment or mounting of sections to glass slides.

**UNIT- IV (09 Hrs.)**

**Staining, Impregnation and Mountants:** Principles of staining, types of Stains, nuclear Stains and cytoplasmic stains. Role of impregnation and types; Commonly used mountants & mounting the slides.

**Recommended Books**

1. Culling Histopathology techniques.
2. Bancroft Histopathology techniques.

**CLINICAL BIOCHEMISTRY- I**

**Subject Code: BMLS1-427**

**L T P C**  
**4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

To teach the principles and procedures of biochemical test.

**UNIT-I (9 Hrs.)**

**Introduction to Clinical Biochemistry:** Hazards & safety measures in clinical Biochemistry laboratory; Quality control and quality assurance; management and maintenance of records; principles of assay procedure for the estimation of glucose, protein, urea, uric acid, creatinine, bilirubin, lipids in the blood, serum, plasma and urine and their normal range.

**UNIT-II (14 Hrs.)**

**Principles, procedures for the estimation of the various biochemical components:** Sodium, Potassium, Chloride, Iodine, Calcium, Phosphorus and Phosphates.

**UNIT- III (12 Hrs.)**

**Clinical Toxicology:** Screening procedures for detection of drugs. Drugs of abuse and their evaluation. Toxic metals – Lead, Mercury, Arsenic, Cadmium and Chromium – Toxicity and their evaluation.

**UNIT- IV (10 Hrs.)**

**Instrumentations:** Detection of radioactivity; applications of radioisotopes in clinical biochemistry; Immunodiffusion Techniques, Radioimmunoassay & ELISA; Autoanalysers.

**Recommended Books**

1. P.B. Godkar, 'Text book of Medical Laboratory Technology'.
2. A. Kolhatkar, 'Medical Laboratory Sciences, Theory & Practical'.
3. Harold Varley, 'Practical Clinical Biochemistry'.
4. U. Satyanarayan. & U. Chakrapani, 'Biochemistry'.
5. Chaterjee & Shinde, 'Text book of Medical Biochemistry'.

**APPLIED HAEMATOLOGY- II**

**Subject Code: BMLS1-428**

**L T P C**  
**4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

Students will understand the different haematological diseases and disorders and role of laboratories for the identification of such abnormalities.

**UNIT-I (9 Hrs.)**

**Anemia Disorder:** Classification of Anemia: Morphological & etiological; Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency; Megaloblastic Anemia; Hemolytic Anemia.

**UNIT-II (10 Hrs.)**

**Leukemia:** Classification: general, specific; signs and symptoms; causes: radiation, genetic conditions; laboratory diagnosis; treatment: Acute lymphoblastic, chronic lymphocytic, acute myelogenous, hairy cells.

**UNIT-III (14 Hrs.)**

**Blood Disorders:** Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis; intravascular coagulation, hemophilia, idiopathic thrombocytopenic purpura



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their mechanisms and laboratory identification; platelet function test; measurement of blood volume, red cell volume.

**UNIT-IV (12 Hrs.)**

**Radioactive Isotopes Their Uses and Management:** Source, half life and their applications; various apparatus used for measurement of radiation; radiation hazards its prevention; disposal of radioactive materials.

**Recommended Books**

1. Paraful B. Godkar, 'Text book of Medical Laboratory Technology'.
2. J.B. Dacie, 'Practical Haematology'
3. V.H. Talib, 'Hand book of Medical Laboratory Technology'.
4. Emmanuel C. Besa, 'Haematology' Harwal Publisher.
5. Sir John, 'Practical Haematology'.
6. Christopher A. Ludlam, 'Clinical Haematology'.
7. John Bernard Henary, 'Clinical Diagnosis & Management by Laboratory Methods'.

**FUNDAMENTALS OF COMPUTER**

**Subject Code: BCAP0-401**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

Student will know the theoretical and working knowledge about the use of computers in medical laboratory science.

**UNIT-I (14 Hrs.)**

**Introduction to Various Computer Parts:** Input output devices: input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices); output devices (monitors, pointers, plotters, screen image projector, voice response systems). Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

**UNIT-II (12 Hrs.)**

**MS- Word, Excel, Power Point:** Components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge; worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs; creation and manipulation presentation, formatting and enhancing text, slide with graphs.

**UNIT-III (10 Hrs.)**

**Introduction of Windows:** History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

**UNIT- IV (09 Hrs.)**

**Application of Computers in Various Fields:** Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.

**Recommended Books**

1. Sunita Goel, 'Computer Fundamentals', Pearson Publication.
2. Anupam Jain and Avneet Mehra, 'Computer Fundamental MS Office: Including Internet & Web Technology'.



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3. P.K. Sinha, 'Introduction to Computers' BPB Publications.
4. Raymond Greenlaw, 'Fundamentals of the Internet & the World Wide Web'.
5. Sunjay Saxena, 'Introduction to Computers and MS Office'.

**IMMUNOLOGY & MYCOLOGY LAB.**

**Subject Code: BMLS1-429**

**L T P C  
0 0 4 2**

**EXPERIMENTS**

1. Performance of Serological tests *i.e.* Widal, VDRL, Rheumatoid factor (RF) Latex agglutination.
2. Demonstration of antigen / antibody determination by Immunodiffusion, ELISA.
3. To prepare culture media used routinely in mycology.
4. To perform the staining techniques for identification of fungi.
5. To process clinical samples for laboratory diagnosis of fungal infections *i.e.* skin, nail hair.

**Recommended Books**

1. Mackie & MacCartney, 'Practical Medical Microbiology', Vol. 1 and 2.
2. G.P. Talwar, S.K. Gupta, 'Hand Book of Practical and Clinical Immunology', CBS, 2006.

**HISTOPATHOLOGY- I LAB.**

**Subject Code: BMLS1-430**

**L T P C  
0 0 2 1**

**EXPERIMENTS**

1. Demonstration of instruments used for dissection.
2. Reception and labeling of histopathological specimens.
3. Preparation of various fixatives: Helly's fluid, Zenker's fluid, Bouin's fluid, Corney's fluid, 10% Neutral formalin, Formal saline, Formal acetic acid, Pereyn's fluid.
4. To perform embedding and casting of block.
5. To process a bone for decalcification.
6. Processing of tissue by manual and automated processor method.
7. To perform section cutting.
8. To perform & practice the Haematoxylin and Eosin staining technique.
9. To perform & practice the Mallory's Phosphotungstic Acid Haematoxylin (PTAH).
10. To learn mounting of stained smears.

**Recommended Books**

1. Culling Histopathology techniques.
2. Bancroft Histopathology techniques.

**CLINICAL BIOCHEMISTRY- I LAB.**

**Subject Code: BMLS1-431**

**L T P C  
0 0 2 1**

**EXPERIMENTS**

1. Estimation of Glucose in Urine and in Blood.
2. Estimation of Protein in Urine and Blood.

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3. Estimation of Urea in blood.
4. Estimation of uric acid in blood.
5. Estimation of serum bilirubin.
6. Estimation of Total Cholesterol in blood.
7. Estimation of HDL Cholesterol.
8. Estimation of LDL Cholesterol.
9. Estimation of TG.
10. Estimation of Creatinine in Blood.
11. Estimation of serum calcium.
12. To measure electrolytes Sodium, Potassium & Chloride.

**Recommended Books**

1. Harold Varley, 'Practical Clinical Biochemistry'.
2. A. Kolhatkar, 'Medical Laboratory Sciences, Theory & Practical'.

**APPLIED HAEMATOLOGY- II LAB.**

**Subject Code: BMLS1-432**

**L T P C**

**0 0 2 1**

**EXPERIMENTS**

1. To estimate serum iron and total iron binding capacity.
2. To detect whether the given specimen is G6PD deficient or normal.
3. To estimate Hb-F in a given blood sample.
4. To estimate plasma and urine Haemoglobin in the given specimens.
5. To demonstrate the presence of Hb-S by Sickling and solubility tests.
6. To test the given blood sample for its osmotic red cell fragility.
7. Cytochemical staining on the given smears such as PAS, SBB, MPO, LAP and Perl's reaction.
8. Estimation of Fibrinogen, Fibrin degradation products (FDPs) and Euglobulin clot lysis test (ELT).
9. Urea clot solubility test for factor XIII.
10. To perform various platelet function tests such as whole blood clot retraction test, prothrombin consumption index (PCI) Platelet adhesion, aggregation and PF3 availability test.

**Recommended Books**

1. J.V. Dacie, 'Practicals in Hematology'.
2. Lynch, 'Medical Laboratory Technology'

**FUNDAMENTAL OF COMPUTER LAB.**

**Subject Code: BCAP0-402**

**L T P C**

**0 0 2 1**

**Introduction to Word**

1. Introduction to Word and its basic editing
2. Text Formatting, Copying and moving text and objects
3. Working with tables and its formatting
4. Working with paragraph and Clipboard

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5. Send Emails using Mail Merge and create hyperlinks in it.
6. Printing documents with header and footers

**Introduction to Spreadsheets**

1. Introduction to Spread Sheets and its basic editing
2. Modifying Spreadsheets, formatting cells
3. Working with formula and functions,
4. Working with Charts and Graphs
5. Sorting and filtering with different Conditions
6. Printing selected cells and sheets

**Introduction to Power Point**

1. Introduction to Power Point and its basic Features
2. Working with slides, adding template and contents to slides
3. Working with charts, Graphs and Tables in Slides
4. Adding animations, Videos and Audio to slides
5. Printing of Presentation
6. Creating a full Presentation with all features of PowerPoint.

**Recommended Books**

1. Sunita Goel, 'Computer Fundamentals, Pearson Publications.
2. Anupam Jain and Avneet Mehra, 'Computer Fundamental MS Office: Including Internet & Web Technology'.
3. P.K. Sinha, 'Introduction to Computers', BPB Publications.
4. Sunjay Saxena, 'Introduction to Computers and MS Office'.

**PARASITOLOGY & VIROLOGY**

**Subject Code: BMLS1-534**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Learning Objectives**

1. The students will learn the morphology, life cycles & laboratory diagnosis of medically important parasites and viruses.

**UNIT- 1**

**Introduction to Medical Parasitology (9 Hrs.)**

Definition- Parasitism, host, vectors; Study of the types of animal association's parasitism commensalisms and symbiosis; Types of parasites; Classification of protozoan & Helminthes; Collection, transport, processing and preservation of samples for routine parasitological investigations.

**UNIT- 2**

**Morphology, Life cycle and Lab Diagnosis of Protozoa, Nematodes and Platyhelminths (14 Hrs.)**

Intestinal Amoebae- *Entamoeba histolytica*, *Entamoeba coli*; Flagellates of intestine/genitalia- *Giardia lamblia*; *Trichomonas vaginalis*; Malarial Parasite- *Plasmodium vivax*; Intestinal Nematodes- *Ascaris*, *Ancylostoma duodenale*; *Taenia solium*.

**UNIT- 3**

**Introduction to virology (10 Hrs.)**

Properties of viruses: structure, replication, growth; Classification of viruses; Cultivation approaches; Collection, transportation and storage of sample for viral diagnosis.

**UNIT- 4**

**Viruses' Life cycle, Diseases and Lab diagnosis (12 Hrs.)**

Polio, Rhino; Influenza; Para influenza; Mumps, Measles; Rubella; Respiratory syncytial, Rota; Chicken pox, Herpes; HIV; Viruses prevalent in India (Dengue, Japanese Encephalitis).

**Course Outcomes**

Through this course student should be able

1. To understand the nature of different parasites.
2. Explain the complete life cycles of intestinal and genital parasites.
3. Complete nature of the viruses.
4. Different types of viral diseases.

**Recommended Books**

1. K.D. Chatterjee, 'Text Book of Parasitology', Chatterjee Medical Publishers, Calcutta.
2. S.C. Parija, 'Text Book of Medical Parasitology'.
3. John B. Carter, Venetia A. Saunders, 'Virology Principles and Applications', John Wiley & Sons, Ltd., 2007.

**CLINICAL BIOCHEMISTRY- II**

**Subject Code: BMLS1-535**

**L T P C  
4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

1. The students will learn about various biochemical aspects of different diseases and diagnosis/prognosis of these diseases.
2. This course will provide information about various clinically important enzymes & automation techniques.

**UNIT- 1**

**Disorders of Metabolism (12 Hrs.)**

Disorders of Carbohydrate Metabolism: Diabetes mellitus, sugar levels in blood, renal threshold for glucose, factors influencing blood glucose level, galactose tolerance tests; Analysis of T3, T4 and TSH, and their significance in diagnosis of metabolic disorders; Disorders of Lipid metabolism: Plasma lipoproteins, cholesterol, triglycerides & phospholipids in health and disease, hyperlipidemia, hyperlipoproteinemias, and ketone bodies; Digestive diseases- Gastric analysis and its importance.

**UNIT- 2**

**Inborn Errors of Metabolism (10 Hrs.)**

Phenylketonuria, alkaptonuria, albinism, tyrosinosis, maple syrup urine disease, Lesch-Nyhan syndrome, sickle cell anemia, Histidinemia.

**UNIT- 3**

**Disorders of liver and kidney (14 Hrs.)**

Normal and abnormal functions of liver and kidney. Jaundice, fatty liver, acute and chronic renal failure; Clearance tests for renal function. Diagnostic Enzymes clinical significance of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine transaminase and Creatine phosphokinase. Qualitative and quantitative analysis of renal calculi and its significance.

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**UNIT- 4**

**Clinical Automation (9 Hrs.)**

History of Automaton, purpose; types of machines used in the routine laboratory practices their principles, construction and working.

**Course Outcomes**

Through this course student should be able

1. To know the metabolic disorders due the deficiencies of various bio- molecules.
2. Concepts of Inborn metabolic problems.
3. Various liver and kidney complications.
4. To understand the clinical automation.

**Recommended Books**

1. M.N. Chatterjea and Rana Shinde, 'Textbook of Medical Biochemistry', Jaypee Brothers.
2. John W. Baynes and Marek Dominiczak, 'Medical Biochemistry (Paperback)', Mosby.
3. Allan Gaw, Michael Murphy, Robert Cowan, Denis O'Reilly, Michael Stewart and James Shepherd, 'Clinical Biochemistry: An Illustrated Colour Text (Paperback)', 3<sup>rd</sup> Edn., Churchill Livingstone.
4. G. Beckett, S. walker, P. Rae, P. Ashby, 'Clinical Biochemistry', 7<sup>th</sup> Edn., Blackwell Publishing.

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**BLOOD BANKING**

**Subject Code: BMLS1-536**

**L T P C**  
**4 0 0 4**

**Duration: 45 Hrs.**

**Course Objectives**

1. The student will learn about blood grouping, transfusion, collection, storage & maintenance.

**UNIT- 1**

**Blood Grouping (12 Hrs.)**

Human Blood Group system: ABO Subgroups, Red Cell Antigen, Natural Antibodies, Rh Antigens; Principal of Blood grouping, antigen-antibody reaction; Blood grouping techniques: Cell grouping, Serum grouping; Difficulties in ABO grouping; Inheritance of the Blood groups.

**UNIT- 2**

**Blood Transfusion & Blood Donation (14 Hrs.)**

Principal & Practice of blood Transfusion; Guide lines for the use of Blood, Appropriate use of Blood, Quality Assurance; Objectives of Quality Assurance in Blood Transfusion services, Standard operating procedures for usage, donation & storage of blood, screening of donor, compatibility testing, safety, procurement of supplies; Blood donor requirements; Criteria for selection & rejection.

**UNIT- 3**

**Blood Collection & Testing Donor Blood (9 Hrs.)**

Blood collection packs; Anticoagulants; Adverse donor reaction; Screening donor's blood for infectious agents - HIV, HCV, HBV, *Trepanoma palladium*, Plasmodium, HTLV.

**UNIT- 4**

**Storage, Transport of Blood and Maintenance of Blood Bank Records (10 Hrs.)**

Changes in blood after storage; Gas refrigerator; Lay out of a blood bank refrigerator; Transportation approaches: Blood bank temperature and stock sheet, transfusion request form.

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**Course Outcomes**

Through this course student should be able

1. Different blood grouping aspects.
2. To understand the blood transfusion and donation processes.
3. To learn the blood collection and testing approaches.
4. Explain the blood storage, transport and maintenance.

**Recommended Books**

1. Haufbrand, 'Essentials of Hematology'.
2. J.V. Dacie, 'Practicals in Hematology'.
3. Lynch, 'Medical Laboratory Technology'.
4. 'Wintrobe's Clinical Hematology'.

**MEDICAL LAB. MANAGEMENT**

**Subject Code: BMLS1-537**

**L T P C  
3 0 0 3**

**Duration: 36 Hrs.**

**Course Objectives**

1. The students will become aware of ethics in a clinical laboratory, Good laboratory practice and Quality Management in a clinical laboratory.

**UNIT- 1**

**Ethical Principles and Good Laboratory Practice (GLP) (10 Hrs.)**

Duties to patient, colleagues, society and other professionals; Aims of GLP and accreditation, advantages of accreditation; awareness of general safety precautions; HIV- pre and post-exposure guidelines; patient management for sample collection, transportation and preservation.

**UNIT- 2**

**Sample Analysis & Reporting (8 Hrs.)**

Sample accountability, methods of accountability; Factors affecting sample analysis; format of test report, reference range, results from referral laboratories; clinical alerts.

**UNIT- 3**

**Financial Management & Auditing (8 Hrs.)**

Awareness of financial management in a clinical laboratory; Horizontal, Vertical and Test audit; Frequency of audit; Documentation.

**UNIT- 4**

**Biomedical Waste Management (10 Hrs.)**

Types of waste in clinical laboratories; preliminary disposal and advanced disposal techniques; Standard national and international guidelines for biomedical waste management.

**Course Outcomes**

Through this course student should be able

1. Explain the various ethical principles and GLP follows in the clinical laboratories on daily basis.
2. To know about the sampling aspects.
3. Explain the financial and auditing processes.
4. To dispose of the biomedical waste.

**Recommended Books**

1. Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi, Rajeev Thakur, 'Medical Laboratory Management Cost- Effective Methods', Viva Books.



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2. P.B. Godkar, D.P. Godkar, Bhalani, 'Text Book of Medical Laboratory Technology', Vol.-1 and 2, 3<sup>rd</sup> Edn., Publishing House, 2005.

**HUMAN VALUES AND PROFESSIONAL ETHICS**

**Subject Code: BHMU0-103**

**L T P C**

**Duration: 36 Hrs.**

**3 0 0 3**

**Course Objectives and Expected Outcomes**

To help the students discriminate between what is valuable and what is superficial in the life. To help the students develop the critical ability to distinguish between essence and form in life - this ability is to be developed not for a narrow area or field of study, but for everyday situations in life, covering the widest possible canvas. To help the students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. It is not sufficient to develop the discrimination ability; it is important to act on such discrimination in a given situation. Knowingly or unknowingly, our education system has focused on the skill aspects (learning and doing) - it concentrates on providing to its students the skills to do things. In other words, it concentrates on providing "How to do" things. The aspects of understanding "What to do" or "Why something should be done" is assumed. No significant cogent material on understanding is included as a part of the curriculum. A result of this is the production of graduates who tend to join into a blind race for wealth, position and jobs. Often it leads to misuse of the skills; and confusion and wealth that breeds chaos in family, problems in society, and imbalance in nature. This course is an effort to fulfill our responsibility to provide our students this significant input about understanding. This course encourages students to discover what they consider valuable. Accordingly, they should be able to discriminate between valuable and the superficial in real situations in their life. It has been experimented at IITH, IITK and UPTU on a large scale with significant results.

**UNIT-I (6 Hrs.)**

**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

Understanding the need, basic guidelines, content and process for Value Education. Self-Exploration-what is it? - its content and process; "Natural Acceptance" and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfill the above human aspirations: understanding and living in harmony at various levels

**UNIT-II (8 Hrs.)**

**Understanding Harmony in the Human Being - Harmony in Myself!**

Understanding human being as a co-existence of the sentient "I" and the material "Body"

Understanding the needs of Self ("I") and "Body" - *Sukh* and *Suvidha*

Understanding the Body as an instrument of "I" (I being the doer, seer and enjoyer)

Understanding the characteristics and activities of "I" and harmony in "I"

Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure *Sanyam* and *Swasthya*



**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

Understanding harmony in the Family- the basic unit of human interaction; Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship; Understanding the meaning of *Vishwas*; Difference between intention and competence  
Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship

**UNIT-III (6 Hrs.)**

**Understanding the Harmony in the Society (Society Being an Extension of Family)**

*Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj*), Universal Order (*Sarvabhaum Vyawastha*) - from family to world family!

**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

Understanding the harmony in the Nature; Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature; Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space; Holistic perception of harmony at all levels of existence

**UNIT-IV (4 Hrs.)**

**Implications of the above Holistic Understanding of Harmony on Professional Ethics**

Natural acceptance of human values Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics:

- Ability to utilize the professional competence for augmenting universal human order,
- Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
- Ability to identify and develop appropriate technologies and management patterns for above production systems;
- Case studies of typical holistic technologies, management models and production systems; Strategy for transition from the present state to Universal Human Order:
- At the level of individual: as socially and ecologically responsible engineers, technologists and managers
- At the level of society: as mutually enriching institutions and organizations

**Recommended Books**

1. R.R. Gaur, R. Sangal, G.P. Bagaria, 'A Foundation Course in Value Education', **2009**.

**Suggested Readings/Books**

1. Ivan Illich, 'Energy & Equity', The Trinity Press, Worcester, and Harper Collins, USA, 1974.
2. E.F. Schumacher, 'Small is Beautiful: A Study of Economics as if People mattered', Blond & Briggs, Britain, 1973.
3. A. Nagraj, 'Jeevan Vidya ek Parichay', Divya Path Sansthan, Amarkantak, 1998.
4. Sussan George, 'How the Other Half Die's', Penguin Press. Reprinted 1986, 1991.
5. P.L. Dhar, R.R. Gaur, 'Science and Humanism', Commonwealth Publishers, 1990.
6. A.N. Tripathy, 'Human Values', New Age International Publishers, 2003.
7. Subhas Palekar, 'How to practice Natural Farming', Pracheen (Vaidik) Krishi Tantra Shodh, Amravati, 2000.

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8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 'Limits to Growth - Club of Rome's report', Universe Books, **1972**.
9. E. G. Seebauer & Robert L. Berry, 'Fundamentals of Ethics for Scientists & Engineers', Oxford University Press, **2000**.
10. M. Govindrajran, S. Natrajan & V.S. Senthil Kumar, 'Engineering Ethics (including Human Values)', Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 'Foundations of Ethics and Management', Excel Books, **2005**.
12. B. L. Bajpai, **2004**, 'Indian Ethos and Modern Management', New Royal Book Co., Lucknow, Reprinted **2008**.

**PARASITOLOGY & VIROLOGY LAB.**

**Subject Code: BMLS1-538**

**L T P C**

**0 0 2 1**

**EXPERIMENTS**

1. Routine stool examination for detection of intestinal parasites with concentration methods: Saline preparation, Iodine preparation, Floatation method, Centrifugation method, Formal ether method, Zinc sulphate method.
2. Identification of adult worms from models/slides: Tapeworm, Ascaris, Hookworms.
3. Malarial parasite: Preparation of thin and thick smears, Staining of smears, Demonstration of various stages of life cycle of malarial parasites from stained slides.
4. Demonstration of fertilized hen egg.
5. Demonstration of virus inoculation routes in fertilized hen egg.

**Recommended Books**

1. J. Ochei, Arundhti Kolhatkar, 'Medical Laboratory Science: Theory and Practice', McGraw Hill Education.
2. K.D. Chatterjee, 'Text Book of Parasitology', Chatterjee Medical Publishers, Calcutta.

**CLINICAL BIOCHEMISTRY- II LAB.**

**Subject Code: BMLS1- 539**

**L T P C**

**0 0 2 1**

**EXPERIMENTS**

1. To perform the Glucose tolerance test of the given sample (GTT).
2. To perform the Insulin tolerance test (ITT).
3. Determination of Uric acid in Urine of the patient.
4. Determination of Creatinine clearance.
5. Determination of Urea clearance.
6. Determination of Serum acid phosphatase.
7. Determination of Serum Alkaline phosphatase.
8. Determination of Serum Lactate dehydrogenase.
9. Determination of Serum CPK
10. Determination of T3, T4 and TSH.

**Recommended Books**

1. K.L. Mukherjee, 'Medical laboratory Technology', Vol.-III.
2. Richard Luxton, 'Clinical Biochemistry',

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3. Barbara H. Estridge et.al, 'Basic Medical Laboratory Techniques'.

**BLOOD BANKING LAB.**

**Subject Code: BMLS1-540**

**L T P C**

**0 0 2 1**

**EXPERIMENTS**

1. Screening of blood donor: physical examination including medical history of the Donor.
2. To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions.
3. Collection and preservation of blood for transfusion purpose.
4. Screening of blood for Malaria, Microfilaria, HBsAg, syphilis and HIV.
5. To determine the ABO & Rh grouping.
6. To perform Direct and Indirect Coomb's test.
7. To perform cross matching.

**Recommended Books**

1. K.L. Mukherjee, 'Medical laboratory Technology', Vol.-I.
2. P.B. Godkar, D.P. Godkar, 'Text Book of Medical Laboratory Technology', Vol. 1 & 2, 3<sup>rd</sup> Edn., Bhalani Publishing House, 2005.

**MEDICAL LAB. MANAGEMENT PRACTICAL**

**Subject Code: BMLS1- 541**

**L T P C**

**0 0 2 1**

1. Clinical sample collection e.g. Blood, Urine, Stool examination, Saliva sample, Sputum sample, Semen.
2. Sample accountability: Labeling of sample, making entries in Laboratory records.
3. Reporting results: Basic format of a test report, Release of examination results.
4. Calibration and Validation of Clinical Laboratory instruments.
5. Biomedical waste management in a clinical laboratory: Disposal of used samples, reagents and other biomedical waste.

**Recommended Books**

1. Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi, Rajeev Thakur, 'Medical Laboratory Management Cost- Effective Methods', Viva Books.
2. P.B. Godkar, D.P. Godkar, 'Text Book of Medical Laboratory Technology', Vol. 1 & 2, 3<sup>rd</sup> Edn., Bhalani Publishing House, 2005.