Shri Vaishnav Vidyapeeth Vishwavidyalaya Indore
Shri Vaishnav Institute of Paramedical Sciences
BACHELOR IN MEDICAL LABORATORY TECHNOLOGY (BMLT)
Syllabus BMLT I SEMESTER
Session 2023-2024

Subject Code	Category	Subject Name	Teaching and Evaluation Scheme								
			Theory			Practical		L	T	P	CREDITS
			End Sem University Exam (60%)	Two Term Exam (20%)	Teacher Assessment (20%)	End Sem University Exam (60%)	Teacher Assessment (40%)				
BMLT101	CC	Basic Histology I (Anatomy & Physiology)	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs): The students will

CEO1: rationalize the basic knowledge of human anatomy.

CEO2: develop understanding about human system histology.

CEO3: gain knowledge about functioning systems in the body.

Course Outcomes (COs): Student should be able to

CO1: understand the human system with emphasis on general anatomy, general histology and various glands.

CO2: acquainted with the regulation of blood, lymphatic system and Immune system.

CO3: understand the regulation of homeostasis in the blood, Identification of blood groups and function of Lymph.

CO4: Recognize and memorize important body systems anatomy and histology.

Unit-I

Introduction: Human Body as a Whole:

- General Anatomy: Definition of anatomy, and its divisions, Terms of positions, planes relationship and movements, Body regions. Body cavities, Membranes – Cutaneous, Serous, Mucous and Synovial membranes and some clinical terms used in anatomy.
- General histology: definition, Electron microscopic structure of Human cell; Tissues-Classification, functions and Microscopic Structures of Primary tissues –Epithelial tissue, connective, tissue, muscular tissue & Nervous tissues
- Glands: Classification, microanatomy of serous & mucous glands with examples.

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Unit-II

Blood, Lymphatic System & Immunity-I:

- Blood volume: Determination of blood volume, Properties of blood.
- The Plasma: Composition character & Functions, The Erythrocytes: Erythropoiesis, Functions, Fragility of RBCs, Fate of RBCs and Erythrocyte sedimentation rate (ESR).
- Hemoglobin: structure, types, compounds of hemoglobin and abnormal hemoglobin,
- Anemia: Types with examples; Polycythemia; Leukocytes – Types, functions, morphology, and formation of WBCs. Structure and functions of platelet with reference of Clotting and anti-clotting mechanisms, anticoagulants.

Unit-III

Blood, Lymphatic System & Immunity-II:

- **Haemostasias**: Bleeding disorders: Purpura, Hemophilia, Vitamin K deficiency and tests for bleeding disorders.
- **Blood group and blood transfusion**- Blood group: different systems, Blood grouping & cross matching and clinical importance. Blood transfusion: Hazards of blood transfusion, storage of blood; Homeostatic imbalances: Sickle-Cell disease, Leukemia; Clinical Connection - Withdrawing Blood, Complete Blood Count. Anticoagulants - Aspirin and Thrombolytic Agents, Hemolytic Disease of the Newborn.
- **The Lymphatic System:** General consideration of Lymphatic system; Gross anatomy of - Cisterna Chyli & Thoracic Duct; Brief discussion over names of regional lymphatics, axillary and inguinal lymph nodes; Histology of – Lymph Node, Spleen, Tonsil & Thymus.

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- **Lymph**: lymphoid tissue formation, composition and function of lymph. Microbial evasion of phagocytosis, Abscesses and Ulcers, Cytokine therapy; Homeostatic imbalances – AIDS, Autoimmune diseases.

Unit-IV

The Cardiovascular System:

- General considerations about basics of Cardiovascular System; Gross anatomy & related applied aspects of Heart – Location, Mediastinum, Shape and Size, Pericardium, Chambers, Exterior & Interior, Blood supply of heart, Systemic & pulmonary circulation.
- Conduction system of heart; Major arteries - Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, Peripheral pulse;
- Major veins - Inferior vena cava, portal vein, portosystemic anastomosis, cephalic vein, Great saphenous vein; Histology of – Elastic Artery, Muscular Artery & Vein.
- Cardiac cycle, Cardiac Output, Cardiac Index and Normal ECG waves.

Unit-V

- **Gastro-intestinal system (with relevant applied anatomy and Physiology):** Parts of the gastrointestinal tract**,** Stomach, Small and large intestine, Gall bladder, Gross anatomy of tongue and liver.
- **Respiratory system (with relevant applied Anatomy and Physiology):** Lungs, Breathing mechanism, Lung Volumes and capacities, O_2 and CO_2 transportations.

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- **Renal system (with relevant applied anatomy and Physiology):** Basic Anatomy of Kidneys, Structure of Nephron, Normal and abnormal urine constitutes, Urine formation, Micturition.
- **Endocrine and Reproductive system (with relevant applied anatomy and Physiology):** Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal gland and male and female gonads.
- **Nervous system (with relevant applied anatomy and Physiology):** Parts of Brain and spinal cord.

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BMLT101(P)	CC	Basic Histology I (Anatomy & Physiology) (Practical)	00	00	00	30	20	0	0	2	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs): The students will

CEO1: identify various systems present in the human body.

CEO2: develop understanding about how human systems work in coordination with other systems.

CEO3: understand, analyze and interpret various histological tests for blood.

Course Outcomes (COs): Student should be able to

CO1: understand and identify the human system with emphasis on general anatomy, general histology, and various glands.

CO2: distinguish various human systems based on their respective functions.

CO3: memorize and perform various histological tests.

CO4: analyze and interpret the results of various blood test.

List of Practical's

- Identification ofepithelium and tissue with examples.
- Identification of bones ofaxial & appendicular skeleton with important bony landmarks.
- Identification of heart & its chambers with great vessels
- Surface anatomy of main arteries, veins and nerves.
- Marking of quadrants of abdomen and Identification of abdominal and pelvicorgans.

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BMLT101(P)	CC	Basic Histology I (Anatomy & Physiology) (Practical)	00	00	00	30	20	0	0	2	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in class, given that no component shall exceed more than 10 marks.

- Estimation of Hemoglobin by – Sahli's method.
- Perform test for White Blood Cell count.
- Perform test for Red Blood Cell count.
- Determination of Blood groups (ABO and Rh system) Landsteiner Law.

Suggested readings:

1. G.K. Pal (2021). ***Textbook of Medical Physiology, 4th edition***. Elsevier.
2. Gyton A.C and Hall J.E. (2020). ***Textbook of medical physiology***, Prism Books(Pvt) ltd. Bangalore.
3. C.C. Chatterjee . ***Human Physiology*** Vol.1 and Vol.2, CBS Publishers & Distributers.
4. Graaff et al, (2013). ***Schaum's Outline of Human Anatomy and Physiology***. McGraw Hill Education. New York City.
5. C. Shier David et al, (2012), ***Hole's Human Anatomy and Physiology***, McGraw Hill Education. New York.
6. Seema Tripathi, ***Human Anatomical and Physiological Systems,*** Viva Books Pvt. Ltd.

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BMLT102	CC	Biochemistry I	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;

*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs): The students will -

CEO1: ingrain the understanding regarding general chemistry, analytical chemistry and micronutrition.
CEO2: understand and comprehend the theories and techniques behind specimen collections.

Course Outcomes (COs): Student should be able to -

CO1: develop profound knowledge about general biochemistry.
CO2: comprehend with principles behind analytical Instrumentation.
CO3: acquainted with carbohydrate metabolism and clinical manifestation.
CO4: acquainted with proteins and nucleic acids metabolism and related disorders.
CO5: differentiate between micronutrient and electrolyte, memorize enzymes and hormones.

Unit-I

General Biochemistry:

- Elementary knowledge of inorganic chemistry; Structure of atom, atomic weight, molecular weight and equivalent weight: Acids, bases and salts. pH indicators: pH meter and pH measurement.
- Molar solutions, Normal solutions, Buffer solutions; Percent solution; Saturated solution; Standard solutions; Elementary knowledge of organic chemistry (Organic compounds, aliphatic, aromatic, alcohol, ethers, phenols, acids etc.)
- Elementary knowledge of Physical Chemistry; Osmosis, osmotic pressure, diffusion, hypotonic, hypertonic and isotonic solutions; Definition and classification of some Colloids and crystalloids.

Unit- II

Elementary Knowledge of Analytical Chemistry

- Principles, Instrumentation, working, uses, care, Maintenance; Balances - mono-pan, two-pan, top-pan; Centrifuges; pH meter; Colorimeter; Spectrophotometer; Fluorimeter; Flame-photometer; Ion selective electrodes; Urinometer; Chromatograph; Electrophoresis; Densitometer.

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BMLT102	CC	Biochemistry I	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Unit- III
Carbohydrates:

- Dietary Sources; digestion; absorption; basic metabolism; regulation of blood glucose & its importance; glucose tolerance test; glycosylated Hb; other parameters and related disorders
- Lipids: Dietary sources digestion; absorption; basic metabolism; lipid profile (cholesterol, triglyceride, lipoproteins, phospholipids) and its significance in various disorders

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Unit-IV
Proteins & Nucleic Acid:

- Dietary sources; digestion; absorption; fate of amino Acids; nitrogen equilibrium; formation and detoxification of ammonia; formation of urea; formation of non protein nitrogenous products e.g. uric acid, creatinine;
- Disorders related to protein and nitrogen metabolism; Definition of DNA, Nucleic acids- structure of DNA Watson & Crick model of DNA- Types of RNA.

Unit-V
Specimen Collection:

- Vitamins, Minerals and Electrolytes: Fat soluble and water soluble vitamins; vitamin deficiency; Na; K; Cl; Ca; Mg; I2; P; Fe and iron binding capacity.
- Enzymes: Classification; properties; factors affecting enzyme Activity; isoenzymes and coenzymes; Clinical enzymology - Therapeutic, diagnostic and analytical uses of enzymes with normal values of serum enzymes.

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- Hormones-Chemical nature and biochemical functions.

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			End Sem University Exam (60%)	Two Term Exam (20%)	Teacher Assessment (20%)	End Sem University Exam (60%)	Teacher Assessment (40%)				
BMLT102(P)	CC	Biochemistry I (Practical)	00	00	00	30	20	0	0	2	1

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*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs): The students will-

CEO1: understand, analyze and interpret test for macronutrients, blood and Urine.

Course Outcomes (COs): Student should be able to -

CO1: memorize and perform various tests.

CO2: analyze and interpret the results of various tests.

List of Practical's:

General tests of biomolecules

- General tests of carbohydrates
- General test of proteins

Urine analysis

- Normal urine.
- Abnormal constituents of urine.

Blood analysis

- Separation of serum from blood.
- Separation of plasma from blood

Suggested readings:

1. U. Satyanarayana and Chakrapani. (2020). ***Outlines of Biochemistry.*** ELSEVIER
2. Victor W. Rodwell, David A. Bender. (2015). ***Harper's Illustrated Biochemistry***. A Lange Medical book.

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BMLT102(P)	**CC**	**Biochemistry I (Practical)**	**00**	**00**	**00**	**30**	**20**	**0**	**0**	**2**	**1**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in class, given that no component shall exceed more than 10 marks.

3. Drew Provan, Andrew Krentz. (2006). ***Oxford Handbook of Clinical and Laboratory***.Oxford University Press.
4. Henry and John Bernard. (2011). ***Clinical Diagnosis and Management by Laboratory Methods*** Philadelphia.
5. B. Rose S. and Mileusnic, R. (1999). ***The Chemistry of Life***. Penguin Press Science.
6. C. Lane, and Oxygen N. (2004). ***The Molecule that Made the World***. Oxford University Press. USA.

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BMLT103	CC	MICROBIOLOGY-I	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs): The students will –

COE1: able to understand the basic characteristics of microorganisms, their growth requirement and describe sources of microorganisms in foods.

COE2: Able to classify and describe food borne diseases and use this information while reporting and investigating an outbreak in the region.

Course Outcomes (COs): Student should be able to -

CO1: develop profound knowledge regarding microorganisms, their action on food and human body.
CO2: comprehend about differentiate between pathogenic and non-pathogenic microorganisms.
CO3: enhance knowledge about microorganisms' growth.
CO4: learn about food hazards and contaminants protein metabolism.
CO5: understand food borne diseases.

Unit-I

Introduction to Microbiology and Microbial Genetics:

- Introduction & brief history of microbiology; Scope & relevance of microbiology.
- The microbial role in disease; The discovery of microbial effects; Introduction & concept of genetics.
- Definition of terminology- genetics, genome, gene, chromosome, base pairs, genetic code, genomics, genotype and phenotype. Types of bacterial variation- genotypic & phenotypic

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BMLT103	CC	MICROBIOLOGY-I	60	20	20	0	0	3	0	0	3

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Unit II

The Bacteria-Bacterial Taxonomy

- Introduction to bacterial taxonomy; Taxonomic classification of organisms; Meaning and definition of taxonomy & classification. Meaning and definition of eukaryotic cell & prokaryotic cell; General property of bacterial cell.
- Morphology and Physiology of Bacteria - Introduction of bacteria, Classification of bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, mesosomes and ribosomes.

Unit III

Growth & Multiplication of Bacteria:

- Meaning of growth of bacteria; Types of bacterial growth with definition of generation time; Growth form in laboratory; Definition of growth curve including its phases; Multiplication of bacteria.
- Factors that affect growth-energy requirement, oxygen; requirement & metabolism, carbon dioxide requirement, temperature, pH, light & osmotic effect; Definition of Psychrophilic & thermophiles bacteria.

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BMLT103	CC	MICROBIOLOGY-I	60	20	20	0	0	3	0	0	3

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Unit-IV

Stains used in Microbiology:

- Introduction of stain; Importance of stain in microbiology; Types of stain in detailed giving example- Simple stain, differential stain, negative stain, impregnation method
- Special staining for certain bacteria result interpretation of Gram staining & Ziehl Neelsen staining.

Unit-V

Bacteriological Media & Culture Techniques

- Introduction of culture media; Basic requirements & uses of culture media.
- Based on constituents/ingredients (simple, complex, synthetic or defined, special), Based on Oxygen requirement (aerobic & anaerobic media), Indication of culture media.
- Types of culture methods (streak culture, stab culture, pour plate method, broth culture) and Anaerobic culture methods.

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BMLT103(P)	CC	Microbiology –I (Practical)	00	00	00	30	20	0	0	2	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;

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Course Educational Objectives (CEOs): The students will-

CEO1: understand and create culture media and methods of culture growth.

CEO2: Develop profound understanding for antibiotic susceptibility.

Course Outcomes (COs): Student should be able to -

CO1: memorize and perform various tests.

CO2: analyze and interpret the results of various tests.

List of Practical's:

1. **Microscope**
   a. Light Microscope
2. **Staining**
   a. Grams staining
   b. ZN staining
3. **Preparation of commonly usedculture media**
   a. Nutrient Agar
   b. Chocolate agar
   c. Mac Conkey agar
   d. Muller Hinton agar
4. **Culture methods**
   a. Streak method
   b. Stab method
   c. Pour Plate method

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5. **Antibiotic susceptibility test**
    a. Diffusion methods
    b. Dilution Methods/ Serial dilution method

- Practical's will be modified as per the feasibility.

Suggested readings:

- Pelczar Mj, Chan ECS and Kleig NR. (1993). ***Microbiology***. Tata McGraw Hill. New York.
- LM Prescott. (2002). **Microbiology.** McGraw Hill. New York.
- Stuart Hoggy, (2005) ***Essential Microbiology***, Wiley and Sons. New York.
- Copal E Hopier . 2011). ***Manual of Clinical Laboratory methods***. Medical Laboratory.

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BMLT104	CC	Pathology-I	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs): The students will-

CEO1: Interpret morphological changes of the disease in correlation to clinical manifestations, lab investigations and radiological findings of the disease

CEO2:Acquire the ability to identify and find appropriate solutions to medical problems

Course Outcomes (COs): Student should be able to -

CO1: develop competency in techniques of pathology branches like hematology, clinical pathology, blood bank, histopathology, and cytology.

CO2: acquire knowledge and understand the formation of blood cells, structure, functions, and methods of estimating different parameters.

CO3: understand the detailed aspects of inflammation and healing inflammation.

CO4: understand the principles of hemodynamic disorder.

CO5: acquire knowledge and understand Nutritional & Infectious Diseases in detail.

Unit-I

Introduction to Pathology:

- Introduction and scope of Pathology; Brief resume of Historical Aspects; Subdivisions of Pathology.
- Ethical aspects of Pathology practice, Laboratory organization, safety and Instrumentations.
- Techniques for Studying Pathology: Basic concepts of Microscope, cryostat, Flow cytometry & PCR.

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Syllabus BMLT I SEMESTER
Session 2023-2024

Subject Code	Category	Subject Name	Teaching and Evaluation Scheme								
			Theory			Practical		L	T	P	CREDITS
			End Sem University Exam (60%)	Two Term Exam (20%)	Teacher Assessment (20%)	End Sem University Exam (60%)	Teacher Assessment (40%)				
BMLT104	CC	Pathology- I	60	20	20	0	0	4	0	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in class, given that no component shall exceed more than 10 marks.

Unit II

Basics of Haematology:

- Introduction to Haematology. Brief description of composition and functions of blood.
- Collection and prevention of blood for various haematological investigations. Normal and absolute values of haematology, quality assurance in haematology.
- Haemoglobinometry, various methods of estimation of Hb, Physiological variations in Hb, PCV, and Platelet.

Unit-III

Haematotogical investigations –

- Haemocytometry, procedures for cell counts (RBCs, WBCs and Platelets), an errors involves and means to minimized such errors.
- Preparation and staining procedures of blood smears, study of morphology of blood cells.
- Determination of haematocrit values.

Unit-IV

Investigations of other biological fluids:

- Composition of urine, Routine examination of urine, abnormal constituents of urine.
- Compositions of different biological fluids (CSF, BAL, Synovial fluid etc.), examination of different biological fluids.
- Composition of Semen. Semen analysis.

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BMLT104	CC	Pathology- I	60	20	20	0	0	4	0	0	4

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Unit-V

Blood and lymphatic Diseases:

- Anemia: types, causes and Cell morphology. Thalassemia, Sickle Cell anemia. Polycythemia.
- Haematoma, Leukemia, Leukocytopenia, Thrombocytopenia, Purpura.
- Lymphoma, Myeloma, Myelodysplastic syndrome (MDS).

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Session 2023-2024

Subject Code	Category	Subject Name	Teaching and Evaluation Scheme								
			Theory			Practical		L	T	P	CREDITS
			End Sem University Exam (60%)	Two Term Exam (20%)	Teacher Assessment (20%)	End Sem University Exam (60%)	Teacher Assessment (40%)				
BMLT104(P)	CC	Pathology–I (Practical)	00	00	00	30	20	0	0	2	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs): The students will-

CEO1: understand, analyze and interpret test for hematology.

Course Outcomes (COs): Student should be able to -

CO1: memorize and perform various tests.

CO2: analyze and interpret the results of various tests.

List of Practical's:

- Hemoglobin estimation – Sahli's method and Cyanmethemoglobin method
- Peripheral blood film (PFB), Preparation,staining by leishman stain & examination.
- Cell counts by Neubauer chamber – RBCs,WBC, Platelets.
- ESR & PCV estimation
- Determination of Blood Groups with Direct and Indirect Coombs Test.
- Understand Leishman's staining and calculate Differential WBC count.
- Determination of packed cell Volume.
- Understand Erythrocytes Sedimentation Rate [ESR]
- Calculation of Blood indices.
- Determination of Clotting Time and Bleeding Time

Suggested readings:

- Porter R. (1997) T***he greatest benefit to mankind: a medical history of humanity from antiquity to the present***. HarperCollins, London.
- B. Rosai J (1997). ***Pathology: a historical opportunity***. Americal Journal of Patholog. Muir's Textbook of Pathology.

Chairperson	Chairperson	Controller of Examinations	Registrar
Board of Studies Paramedical and Allied Sciences Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore	Faculty of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore	Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore	Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

- M.I. Filipe et.al. (202). ***Histochemistry in Pathology.*** Churchill Livingstone. London.