



Shri Vaishnav Vidyapeeth Vishwavidyalaya Indore

Shri Vaishnav Institute of Paramedical Sciences

BACHELOR IN MEDICAL LABORATORY TECHNOLOGY (BMLT)

Syllabus BMLT VI SEMESTER

Session 2022-2023

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%)				
BMLT601	CC	Applied Histology III	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 on the 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 fundamental knowledge of the Body systems.

CEO2: understanding detailed Advance procedures.

Course Outcomes (COs): Student should be able to

CO1: understand the different organs & their functions.

CO2: acquainted with the different procedures.

CO3: Identification of the different clinical conditions.

CO4: Learn some important clinical identification processes of diseases.

Unit-I

Tissue Histology & Applied Diagnostic Correlation

- **Histology of Gastrointestinal Tract:** Stomach, intestine, liver, pancreas; common pathological correlations.
- **Histology of Respiratory & Cardiovascular Systems :** Lung, trachea, heart; diseases demonstrated through histology.
- **Histology of Renal & Urinary System :** Glomerulus, tubules; renal biopsy interpretation basics.
- **Histology of Endocrine & Reproductive Systems :** Thyroid, adrenal, ovary, testis; key clinical conditions.
- **Histology of Nervous & Musculoskeletal Systems :** Brain, peripheral nerves, skeletal muscle; degenerative and inflammatory diseases.

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Unit-II

Staining Techniques – Routine, Special & Manual Procedures

- **Hematoxylin & Eosin (H&E) Staining:** Principles, variations, troubleshooting, automation vs manual H&E.
- **Special Stains for Carbohydrates & Connective Tissue:** PAS, Alcian blue, Reticulin stain.
- **Special Stains for Microorganisms:** Gram, Ziehl–Neelsen, GMS.
- **Cytochemical Stains:** Perls' Prussian blue, Oil Red O, Toluidine blue.
- **Manual vs Automated Staining Systems:** Advantages, limitations, QC measures.

Unit-III

Applied Histology:

- Handling of fresh histological specimen, cryo/frozen section of fresh and fixed tissue, freeze drying.
- Lipid identification and demonstration
- Micro-organism in the tissue-various staining techniques for their demonstration and identification.
- Nucleic acid, DNA and RNA special stains and procedures.
- Cytoplasmic constituent and their demonstration.

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Unit-IV

Advanced Histopathology Techniques & Modern Diagnostics

- Immunohistochemistry (IHC): Principles, markers (cytokeratins, CD markers), antigen retrieval, controls.
- Immunofluorescence (IF) & Frozen Section Diagnostics: Renal biopsy IF, intraoperative frozen consultation.
- Molecular Histopathology Techniques: FISH, CISH, PCR-based histology applications, gene panels.
- In-situ Hybridization & Advanced Labeling: RNA/DNA probes, diagnostic uses in oncology & infectious diseases.

Unit-V

Applied Laboratory Practice & Quality Assurance

- Histology Laboratory Quality Control: Internal QC, external QA, proficiency testing, documentation.
- Biosafety, Waste Disposal & Regulatory Guidelines: Biomedical waste management, accreditation standards (NABL).
- Automation in Histopathology: Tissue processors, auto-stainers, automated IHC, LIS workflow.
- Error Management: Fixation errors, staining abnormalities, microtomy issues.

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BMLT601(P)	CC	Applied Histology III (Practical)	00	00	00	30	20	0	0	2	1

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Course Outcomes (COs): Student should be able to

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CO2: Acquainted with the different procedures.

CO3: Identification of the different clinical conditions.

CO4: Learn some important clinical identification processes of diseases.

List of Practical's

- Carbohydrate & Mucin Stains.
- Reticulin staining (silver impregnation)..
- Section cutting on rotary microtome.
- Embedding & Block Making
- Tissue Fixation Techniques
- Practice of Laboratory Safety & Biosafety Measures

➤ **Practical's will be modified as per the feasibility.**

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Suggested readings:

1. William J Krause. *Krause's Essential Human Histology for Medical Students, 3rd edition*.
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. Sangeeta M et al, *Concise Text Book of Histology*, Thieme.
6. Praful B Godkar et al, *Text book of Medical Laboratory Technology*, Bhalani Medical Book House.

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BMLT602	CC	Clinical Biochemistry II	60	20	20	0	0	3	0	0	3

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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:

CEOs 1: Explain the clinical significance of the laboratory tests

CEOs 2: To train students in the principles and applications of clinical chemistry tests used in diagnosis, prognosis, and monitoring of diseases.

CEOs 3: To develop skills in handling, processing, and analyzing biological specimens while maintaining accuracy and safety.

CEOs 4: To impart knowledge of quality control and quality assurance in clinical biochemistry laboratories to ensure reliable results

Course Outcomes (COs): Students should be able to understand :

COs 1: The principles and importance of quality control, types of automation used in clinical investigations.

COs 2: Demonstrate knowledge of record management, documentation, and report maintenance in a clinical laboratory

COs 3: Conduct and interpret various clinical examination for diagnostic purposes

Unit-I: Clinical control, Automation, Organisation, Management and Maintenance of records in the Clinical Biochemistry Laboratory

- Quality control of clinical investigations
- Automation in clinical biochemistry laboratory.
- Laboratory organizations, Management and maintenance of records,
- Brief knowledge about rapid techniques in clinical biochemistry

Unit-II: Principle for Assay Procedure for Biological Material:

- | | |
|------------------------|--------------------------------|
| 1. Total Protein | 8. Cholesterol |
| 2. Total albumin | 9. Serum Bilirubin |
| 3. Glucose | 10. Sodium |
| 4. Blood Urea | 11. Potassium |
| 5. Uric acid | 12. Chloride |
| 6. Serum Creatinine | 13. Serum Calcium |
| 7. Creatinine in urine | 14. Serum Inorganic phosphates |

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Unit-III:

Method of estimation and assessment for: organ function test:

- Kidney Function test –General consideration evaluation of KFT
- Liver Function test-Liver Function .Investigation of liver function uses of Liver Function Test
- Pancreatic Function Test-Function pancreases, pancreatic juice and function test
- Gastric Function-General consideration, Chemical analysis of gastric content .Clinical Significance
- Test for Thyroid-Thyroid function, importance of thyroid function tests
- Cardiac profile test –General consideration cardiac function, ischemic heart disease

Unit IV: Estimation Of Clinical Enzymes

- Acid phosphatase Alkaline phosphatase
- Lactate dehydrogenase
- Aspartate transaminase
- Alanine transaminase
- Creatine phosphokinase

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Unit V:

Clinical Biochemistry Tests: Renal Clearance, Qualitative Analyses, And CSF Examination

- Clearance test for renal function.
- Qualitative test for: Urobilinogen Barbiturates T3, T4 and TSH Ketosteroids
- Qualitative analysis of Renal calculi.
- Chemical examination of Cerebrospinal fluid.

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BMLT602(P)	CC	Clinical Biochemistry II (Practical)	00	00	00	30	20	0	0	2	1

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Course Educational Objectives (CEOs): The students will:

CEOs 1: Explain the clinical significance of the laboratory tests

CEOs 2: Perform routine clinical laboratory procedures within acceptable quality control parameters in Hematology, Chemistry, Immunohematology, under the general supervision of a Clinical Laboratory Scientist or Pathologist.

Course Outcomes (COs): Students should be able to:

COs 1: perform the Biochemical test

COs 2 perform clinical urine tests for diagnostic purposes

COs 3 perform the hematology based analysis

Clinical Biochemistry Practical's:

1. Estimation of Glucose in Urine and in Blood.
2. Estimation of Protein in Urine and Blood.
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. T3, T4, TSH (Data Interpretation Only)
12. To measure electrolytes Sodium, Potassium & Chloride.

RECOMMENDED READING

1. **Textbook of Medical Laboratory Technology** – Godkar
2. **Practical Clinical Biochemistry** – Ranjna Chawla
3. **Essentials of Biochemistry** – Satyanarayana & Chakrapani
4. **Essentials of Biochemistry** – Pankaja Naik
5. Textbook of Clinical Biochemistry - .Teitz

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BMLT603	CC	Medical Microbiology II	60	20	20	0	0	3	0	0	3

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Course Educational Objectives (CEOs): The students will:

CEOs 1 The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.

CEOs 2: To study various Bacterial, Viral, Protozoan and Fungal diseases.

Course Outcomes (COs): Students should be able to:

COs 1: Understand the diagnostic tests, instrument calibration and develop new testing kits in field of research.

COs 2: Understand routine laboratory procedure.

COs 3 Proficiency in discovering newer methods of analysis.

COs 4 Understand the logical interpretation of clinical lab investigations.

Unit-I

Introduction to Clinical Microbiology

- Bacteriological examination of water, milk.
- Bacteriological examination of food and air.
- Mantoux Test.
- Toxin-Antitoxin assays and pathogenicity tests.

Unit-II

Lab. Diagnosis of common bacterial infections :

- Pyogenic infections, Meningitis, Diphtheria, Whooping cough, Gas gangrene, Food-poisoning, Enteric fever, Cholera, Tuberculosis, Leprosy, Plague, Anthrax, Typhus fever, Syphilis, Gonorrhea and other STD's,
- Respiratory tract infection, Urinary tract infection.
- Serological tests: Widal, ASO, CRP, VDRL, TPHA.
- Testing of disinfectants-Rideal-Walker, Chick-Martin and In-use tests.

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Unit III

Laboratory diagnosis of fungal infections viz:

- Candidiasis, Cryptococcosis, Mycetoma, Other deep mycotic infections, subcutaneous fungal infection sporotrichosis.
- Serological tests for fungal infections and skin tests.
- Advanced techniques in microbiology – ELISA, RIA,
- KOH mount

Unit IV

Lab. Diagnosis of parasitology –

- Diagnosis of morphology and life cycle of trematodes:-
- schistosomiasis Intestinal flukes, Blood flukes, Lung flukes
- Serological & immunological technique used for the diagnosis of :- gel diffusion THFA,
- ELISA.

Unit-V

Basic Virology Methods-

- Serological techniques used in Virology –HA, HAI, CFT, CIEP.
- Principles of serological techniques used in Virology – ELISA, RHA.
- Mode of transmission of viral agents.
- Prevention of viral diseases, Immunity in viral infections.

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List of Practical's

Medical Microbiology Practical's:

1. To study working principle of various microscope, care and maintenance
2. Determination of Milk Freshness by Methylene Blue Test Bacteria.
3. Laboratory Procedure for Detection of Typhoid Using Widal Test.
4. To study bacteria by gram staining method.
5. Technique of Isolating Individual Colonies on Nutrient Agar.
6. Sterilization techniques.
7. Gram staining

➤ **Practical's will be modified as per the feasibility.**

SUGGESTED READINGS

- Praful B. Godkar & Darshan P. Godkar 4th Edition (2024), Bhalani Publishing House, 2-Volume Set.
- Anathanarayana & Panikar Medical Microbiology Ananth Narayan
- Stuart Hoggy, (2005) Essential Microbiology, Wiley and Sons. New York.
- Baveja, C. P. (2024). *Textbook of Microbiology* (8th ed.). Arya Publishing Company.
- Chakraborty P. *Microbiology*. 2nd ed. Kolkata: New Central Book Agency; 2017.
- Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2014). *Prescott's microbiology*. McGraw-Hill

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Course Educational Objectives (CEOs): The students will-

CEO1: Acquire the ability to identify and find appropriate solutions to medical problems.

CEO2: Interpret morphological changes of the diseases in correlation to clinical manifestations and laboratory investigations of the diseases.

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

CO1: Develop competency in techniques of Haematology.

CO2: Acquire knowledge and understand the background of hematology.

CO3: Understand the principles of Routine laboratory tests.

CO4: Acquire knowledge and understand diseases and diagnosis.

Unit-I Blood:

- Blood: Formation, composition & functions
- Collection of blood (Phlebotomy)
- Difference between Capillary & Venous blood sample
- Anticoagulants: Uses, types & advantages/disadvantages
- Haemoglobin estimation in haematology laboratory

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Vaishnav Institute of Paramedical Sciences
BACHELOR IN MEDICAL LABORATORY TECHNOLOGY (BMLT)
Syllabus BMLT VI SEMESTER
Session 2022-2023

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%)				
BMLT604	CC	HAEMATOLOGY III	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.

Unit II

Bone marrow:

- Bone marrow in detail
- Hematopoiesis
- Bone marrow examination
- Bone marrow Aspiration & Biopsy
- Bone marrow abnormal & normal findings.

Unit-III

Clinical Haematology:

- Peripheral Blood smear preparations
- Morphological changes of blood cells
- Red Blood cell count by Neubauer's counting chamber
- Differential count of WBC
- Absolute Eosinophil Count
- Sickling test
- Reticulocyte count

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Unit-IV

Routine Procedures:

- Romanowsky dyes
- Pre and Post analytical errors
- Automation in hematology
- Leishman staining
- Field staining
- Complete blood count, determination by automated method and significance of each parameter,

Unit-V

Routine Examination of Urine:

- Urine Formation.
- Physical examination of Urine
- Chemical examination of Urine
- Microscopic examination of Urine.

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BMLT604(P)	CC	HAEMATOLOGY III (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: 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 Haematology.

CO2: Acquire knowledge and understand the background of hematology.

CO3: Acquire knowledge and understand diseases and diagnosis.

List of Practical's:

- Differential count of WBC
- Hb estimation
- Urine Physical examination.
- RBC count by Cell counter
- Phlebotomy
- Bone marrow examination
- Leishman staining
- CBC Test by Auto analyzer

Suggested readings:

- Porter R. (1997) *The 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.
- M.I. Filipe et.al. (202). *Histochemistry in Pathology*. Churchill Livingstone. London.
- Textbook of Medical laboratory technology by prafull G B Godkar sixth edition.

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