SEMESTER II - SYLLABUS

Course Name : Basics of Biochemistry **Credit = 4 (60 hours)**

Course Rationale: Students will learn the basic concepts of Biochemistry, chemistry of carbohydrates, proteins, lipids, nucleic acids, enzymes, vitamins, minerals and nutritional requirements.

Learning Objective: At the end of the course, students should be able to

- Describe the structure and function of key biomolecules, including carbohydrates, proteins, lipids, and nucleic acids.
- Explain the fundamental principles of enzyme action, including enzyme kinetics, inhibition, and regulation.
- Demonstrate knowledge of biochemical techniques used to analyse biomolecules.

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

Course Name: Basics of Biochemistry **Practical Credit = 2 (60 hours)**

Course rationale: Students will learn the essential laboratory practices, which include the Preparation of Lab reagents and qualitative analysis of carbohydrates, proteins and lipids.

1. Demonstrate the use of Laboratory Apparatus, Micropipettes, and their uses
2. Demonstrate cleaning of glassware
3. Demonstrate the use of a laboratory balance
4. Prepare and label common Laboratory reagents (Percentage, Molarity, Normality)
5. Preparation of distilled water, double-distilled water, and deionised water.
6. Measure pH for laboratory reagents/ biological samples
7. Perform qualitative analysis of carbohydrate and identification of unknown carbohydrate-

   Molisch test, Benedict test, Modified Bareford test, Seliwanoff test, Bial test, Mucic acid test, Iodine test, Foulger's test, osazone test
8. Perform qualitative analysis of protein and amino acids- Precipitation test - Heat and acetic acid Test, Heller's test, alkali, alcohol, Isoelectric point precipitation. Colour reaction – Ninhydrin, Nitroprusside test, Xanthoproteic test, Million test, Sakaguchi test
9. Perform qualitative analysis of lipids – Solubility test

***Clinical laboratory rotation/observation can be incorporated wherever possible**

BACHELOR IN MEDICAL LABORATORY SCIENCE (B.MLS)

Background

Bachelor of Medical Laboratory Science (BMLS) is an undergraduate degree program designed to prepare students for a professional career in **clinical laboratory science,** which plays a critical role in diagnosing, treating, and monitoring diseases. The course is designed to be of 4 years duration (including one year compulsory internship).

- **Eligibility for admission:** The candidate must have passed Higher Secondary (10+2) or equivalent examination recognised by any Indian Board or a duly constituted Board or National Open School with at least 50% marks in aggregate of physics, chemistry and biology (botany & zoology).
- Admission to Bachelor of Medical Laboratory Science program shall be made on the basis of NEET examination and merit list based on 10+2 marks.
- Candidates who have studied abroad and have possess equivalent qualification as determined by the Association of Indian Universities and Equivalence Committee of the NCAHP and fulfil the above criteria shall also be eligible for admission.
- Candidates must be 17 years as on December 31 of the year of admission to first year of BMLS course.
- Candidates must furnish a certificate of Physical fitness from an Authorized Medical Professional, at the time of application, to ascertain that the candidate does not have any physical disability
- **Degree Awarded:** Bachelor's of Medical Laboratory Science (BMLS)
- Medium of instruction: English
- **Lateral Entry for candidates with Diploma in Medical Laboratory Science:** Candidates who have obtained Diploma in Medical Laboratory Science from recognised Universities/Institutions will be eligible for direct admission to Second year of BMLS course. Only 10% of sanctioned strength of BMLS course can be allotted to Lateral **entry** candidates, based on merit.

Program Objectives:

- Equip students with knowledge of laboratory procedures across **haematology, clinical biochemistry, microbiology, immunology, histopathology,** and **molecular diagnostics.**
- Train students to operate, maintain, and troubleshoot modern diagnostic equipment.
- Emphasize quality control, laboratory safety, and ethical practice.
- Develop critical thinking and diagnostic interpretation skills.

Core Subjects included in the curriculum are:

1. Human Anatomy & Physiology
2. Biochemistry
3. Pathology
4. Microbiology

5. Hematology
6. Immunology & Serology
7. Blood Banking & Transfusion Science
8. Clinical Biochemistry
9. Histopathology & Cytology
10. Molecular Biology & Genetics
11. Laboratory Management & Quality Assurance
12. Research Methodology

The course curriculum is designed to provide special emphasis on hands-on lab sessions in hospital or diagnostic laboratories, Internships in clinical settings, in the final year

Career Opportunities:

Upon successful completion of the course, Graduates can work as:

- Medical Laboratory Technologists
- Clinical Research Assistants
- Clinical Lab Managers
- Quality Control Officers
- Molecular Lab Technologists

In Hospitals, Diagnostic labs, Blood banks, pharmaceutical companies, public health organizations, Research institutions.

Students also have higher studies options including, Master of Medical Laboratory Science, M.Sc. in disciplines like Microbiology, Biochemistry, or Biotechnology, MBA in Hospital or Healthcare Management.

Learning objectives

1. Foundational Knowledge

- Understand the normal structure and function of the human body.
- Explain the pathophysiological basis of disease and how laboratory tests aid diagnosis.
- Apply knowledge of microbiology, hematology, biochemistry, immunology, and molecular biology to clinical scenarios.

2. Laboratory Skills

- Perform routine and specialized laboratory tests accurately in various disciplines (e.g., hematology, microbiology, clinical chemistry, histopathology).
- Operate, calibrate, and maintain laboratory instruments and equipment.
- Collect, handle, and process biological specimens following safety and quality standards.

3. Quality Assurance & Safety

- Implement quality control procedures to ensure accuracy and reliability of test results.
- Adhere to biosafety and infection control guidelines in all laboratory practices.
- Identify and troubleshoot pre-analytical, analytical, and post-analytical errors.

4. **Critical Thinking & Problem Solving**
   - Analyze and interpret laboratory data for clinical relevance.
   - Recognize abnormal results and understand their diagnostic implications.
   - Apply logical reasoning to solve technical problems and improve procedures.
5. **Communication & Collaboration**
   - Communicate effectively with healthcare professionals, patients, and laboratory teams.
   - Maintain clear and accurate laboratory records and reports.
   - Demonstrate professional and ethical behaviour in a clinical setting.
6. **Research & Lifelong Learning**
   - Understand the principles of scientific research and evidence-based practice.
   - Participate in small-scale research or projects related to laboratory science.
   - Stay updated with current advances in laboratory medicine and emerging technologies.
7. **Professional Development**
   - Demonstrate responsibility, initiative, and time management in professional duties.
   - Understand legal and ethical issues in laboratory practice.
   - Prepare for national certification or licensing exams, if applicable.

PROGRAM OUTCOMES (POs)

Upon successful completion of the BMLS program, students will be able to:

POs	Outcome
PO1	Apply scientific knowledge in professional healthcare practice.
PO2	Demonstrate clinical and technical skills to deliver quality healthcare services.
PO3	Collaborate effectively in teams within an interdisciplinary healthcare setting to improve societal health.
PO4	Uphold ethical values and professionalism within the legal framework of society.
PO5	Communicate effectively with healthcare teams and the community.
PO6	Practice evidence-based medicine to ensure high-quality professional performance.
PO7	Engage in continuous learning and adapt to technological advancements for professional growth.
PO8	Exhibit entrepreneurial, leadership, and mentorship skills for independent practice and collaborative work in healthcare.
PO9	Demonstrates an appropriate use of information and communication technology relevant to their field.
PO10	Takes responsibility for personal and professional development and demonstrates an obligation to maintain competency by applying newly acquired knowledge or abilities to patient care

PROGRAM SPECIFIC OUTCOMES (PSO)

POs	Outcome
PSO-1	Proficiently perform a full range of clinical laboratory tests, develop and evaluate test systems and interpretive algorithms and should be able to work on automated machines.
PSO-2	Manage information to enable effective, timely, accurate, and cost effective reporting of laboratory-generated information and make specimen-oriented decisions on predetermined criteria, including working knowledge of critical values.
PSO-3	Process information and ensure quality control as appropriate to routine laboratory procedures.

GRADUATE ATTRIBUTES

Upon graduation, students from this institution will possess the following attributes:

Sl. No	Attribute	Description
1	**Knowledge and Understanding**	Apply scientific knowledge and critical thinking in their field.
2	**Communication & Professionalism**	Communicate effectively with diverse audiences in various formats.
3	**Critical Thinking**	Analyse information and solve problems logically.
4	**Inquiry and Research**	Ask questions, investigate, and pursue new knowledge.
5	**Digital Literacy**	Use digital tools and technologies effectively and responsibly.
6	**Professionalism & Ethics**	Act ethically, responsibly, and professionally.
7	**Lifelong Learning**	Continuously seek and acquire new knowledge and skills.
8	**Leadership & Teamwork**	Lead and work effectively in diverse teams.
9	**Interdisciplinary Skills**	Work effectively across different fields of study.
10	**Social Responsibility**	Contribute positively to society and understand global issues.
11	**Multi-cultural Competence**	Work respectfully and effectively in diverse cultural settings.
12	**Competence & Capability**	Perform their professional duties effectively and skillfully.

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