



**Gyanmanjri**  
Innovative University

Syllabus  
Gyanmanjri Science Colleges  
Semester-3 (M.Sc. MLT)

**Subject:** Clinical Biochemistry-MSCMT13515

**Type of course:** Major

**Prerequisite:** Students should have a basic knowledge of biochemistry, including structure and function of biomolecules (proteins, carbohydrates, lipids, and nucleic acids), enzyme kinetics and regulation, metabolic pathways, as well as an understanding of fundamental physiological and molecular processes..

**Rationale:** This course provides a strong foundation in biochemistry essential for understanding molecular mechanisms of normal body function and disease, enabling students to interpret laboratory data, apply biochemical principles in clinical practice, and support accurate diagnosis and patient management.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks					Total Marks
CI	T	P		Theory Marks		Practical Marks		CA	
			ESE	MSE	V	P	ALA		
4	0	0	4	60	30	10	00	50	150

*Legends: CI-Class Room Instructions; T- Tutorial; P- Practical; C- Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V- Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*

3 Credits \* 25 Marks = 75 Marks (each credit carries 25 Marks) Theory

1 Credits \* 25 Marks = 25 Marks (each credit carries 25 Marks) Practical

SEE 100 Marks will be converted in to 50 Marks

CCE 100 Marks will be converted in to 50 Marks

It is compulsory to pass in each individual component.



## Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	<b>Carbohydrate Identification Lab</b> Faculty will provide unknown sugar samples, and students will perform Benedict's and Iodine tests to identify reducing sugars and starch. Students will record observations, analyze results, and upload the report to the GMIU WEB portal.	10
2	<b>Monosaccharide Structure Model</b> Faculty will assign specific sugars (glucose, fructose), and students will build linear and cyclic models using charts to show aldose/ketose and anomers. Students will take photos and upload them to the GMIU WEB portal.	10
3	<b>Lipid Extraction Activity</b> The faculty will guide students to extract lipids from food samples (peanuts/oil seeds) using simple solvents. Students will observe, document the process, and upload their findings to the GMIU WEB portal.	10
4	<b>Enzyme Kinetics Graph Task</b> Faculty will provide experimental data, and students will plot substrate vs reaction rate graphs, interpret enzyme kinetics, and upload their analysis to the GMIU WEB portal.	10
5	<b>Case Study on Lipid Disorders</b> Faculty will provide a clinical case (high cholesterol), and students will analyze causes, effects, and prevention. Students will upload their report to the GMIU WEB portal.	10
<b>Total</b>		<b>50</b>



**Course Content:**

Unit No	Course content	Hrs	% Weightage
1	<b>Biochemistry of Carbohydrates</b> <ul style="list-style-type: none"> <li>• Occurrence, classification, basic chemical structure, monosaccharides, aldoses, and ketoses.</li> <li>• cyclic structure of monosaccharides, stereoisomerism, anomers and epimers.</li> <li>• general properties and functions of polysaccharides and complex carbohydrates; amino sugars, and glycoproteins.</li> <li>• Mucopolysaccharides, deoxy sugars, amino sugars, and sugar acids.</li> </ul>	15	25
2	<b>Biochemistry of Lipids</b> <ul style="list-style-type: none"> <li>• Structure, distribution and biological importance of fats and fatty acids and derived essential fatty acids- eicosanoids-prostaglandins, leukotrienes and lipoxins. Chemical properties and characterization of fats.</li> <li>• Different dietary types of fatty acids, requirements, utilization and functions.</li> <li>• Steroids and bile salts.</li> <li>• Circulating lipids, Lipoproteins, chylomicrons, LDL, HDL, and VLDL.</li> </ul>	15	25
3	<b>Biochemistry of Proteins</b> <ul style="list-style-type: none"> <li>• Proteins Classification, structure and properties of amino acids, zwitter ions, rare amino acids, D amino acids.</li> <li>• Classification and properties of proteins, – Peptide synthesis: reactive ester method and sequencing of proteins,</li> <li>• Primary structure: Peptide conformation, N- and C- terminal, peptide cleavage</li> <li>• Secondary structure: <math>\alpha</math>-helix, <math>\beta</math>-sheet, random coil, Ramachandran plot</li> <li>• Tertiary structure: Forces stabilizing, unfolding/refolding experimentation.</li> <li>• Quaternary structures: Structure and function of hemoglobin. Structure, coagulation and denaturation of proteins.</li> </ul>	15	25



4	<b>Enzymology</b> <ul style="list-style-type: none"> <li>● Extraction and purification enzyme</li> <li>● Protein folding and denaturation</li> <li>● Enzyme Kinetics</li> <li>● Mechanism of enzyme action-catalysis mechanisms and lysozyme</li> <li>● Enzyme regulation</li> </ul>	15	25
---	--	----	----

**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	30%	20%	10%	10%	10%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Course Outcome:**

After learning the course the students should be able to:	
CO1	Classify and explain the structure, properties, functions, and biological significance of carbohydrates in living systems
CO2	Interpret and apply the concepts of lipid structure, classification, metabolism, and physiological functions in biological systems.
CO3	Analyze the relationship between the structure, synthesis, and functions of proteins and amino acids in biological processes.
CO4	Evaluate enzyme properties, mechanisms, kinetics, inhibition, and regulatory roles in biochemical reactions and metabolic pathways.

**Instructional Method:**

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.



From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory .

The internal evaluation will be done on the basis of Active Learning Assignment/Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

#### Reference Books:

1. Principles of Biochemistry”, Lehninger C Recent Edition.
2. Biochemistry”, L. Stryer, W.H. Freeman, San Francisco.
3. Schaum’s “Outline Series of Theory and Problems of Biochemistry”, Philip W. Kuchel and G.B. Ralston. Int. Ed., McGraw-Hill Book Co.
4. Problem Approaches in Biochemistry”. Wood and Hood
5. DNA: The Secret of Life” by James D. Watson, Andrew Berry
6. Review of Physiological Chemistry” by Harold A Harper, Lange Medical Publications Latest Edition

