



GUJARAT TECHNOLOGICAL UNIVERSITY
Master of Science (Integrated-Biotechnology)

Semester: 8

Subject Name: Medical Biochemistry

Subject Code: 1380406

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
4	0	8	8	70	30	30	20	150

Prerequisite:

The prerequisites for Medical Biochemistry typically include a strong foundation in biology, chemistry, and basic physics. A background in organic chemistry and molecular biology is essential, as these subjects form the basis for understanding biochemical processes. Familiarity with human physiology and genetics is also beneficial. For advanced study, knowledge of analytical techniques, enzymology, and metabolism is helpful. If you're entering a medical or biotechnology program, a fundamental understanding of biochemical pathways, protein structure, and cellular mechanisms will make learning more manageable.

Rationale:

Medical Biochemistry is essential for understanding the biochemical processes that sustain life and how their alterations lead to diseases. It provides insights into metabolic pathways, enzymatic functions, and molecular interactions crucial for diagnosing, treating, and preventing medical conditions. By integrating biochemical principles with clinical applications, Medical Biochemistry plays a vital role in drug development, personalized medicine, and advancements in healthcare, ensuring a deeper comprehension of disease mechanisms and therapeutic interventions.

Course Content:

Unit No.	Content	No. of Hours	Weightage (%)
1	Advanced Biomolecules & Structural Biochemistry <ul style="list-style-type: none">Biomedical significance of carbohydrates, lipids, proteins & nucleic acidsProtein folding & misfolding: Alzheimer's, Prion disorders, AmyloidosisHemoglobin biochemistry; variants and hemoglobinopathiesMembrane biochemistry & transport disorders (CFTR, Wilson's, Menkes)Redox biochemistry & free radicals; biochemical basis of oxidative stress	15	26
2	Enzymology & Metabolic Regulation in Disease <ul style="list-style-type: none">Enzyme kinetics: Michaelis-Menten, LB plot, allosteric regulationIsoenzymes in diagnosis: LDH, CPK, ALP, AST, ALTEnzyme inhibition in therapeutics: statins, ACE inhibitors, NSAIDs	10	16



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	<ul style="list-style-type: none"> Metabolic regulation in fed, fasting & starvation states Inborn errors of metabolism (selected): PKU, MSUD, MCAD deficiency, GSD-I 		
3	Intermediary Metabolism & Clinical Disorders <ul style="list-style-type: none"> Carbohydrates: glycolysis, TCA, gluconeogenesis; diabetes & metabolic syndrome Lipids: β-oxidation, cholesterol transport; fatty liver, NAFLD/NASH, atherosclerosis Proteins/Amino acids: urea cycle; hyperammonemia and organic acidemias Nucleotides: purine/pyrimidine metabolism; Gout, SCID, Lesch–Nyhan Integration & interpretation of metabolic disturbances in diseases 	10	16
4	Endocrine & Immuno-Biochemistry and Molecular Signaling <ul style="list-style-type: none"> Mechanisms of hormone signaling: GPCR, RTK, JAK-STAT, nuclear receptors Pancreatic, thyroid, adrenal & gonadal hormone dysregulation Biochemistry of inflammation: cytokines, acute-phase proteins, complement system Apoptosis & autophagy pathways; role in disease pathogenesis Oxidative stress, antioxidant defenses & ROS-mediated injury 	10	26
5	Clinical & Analytical Biochemistry for Medical Biotechnology <ul style="list-style-type: none"> Organ function profiles: liver, kidney, thyroid, pancreas, cardiac profile Acid-base balance, blood gases, electrolytes Tumor markers & disease biomarkers (AFP, CEA, CA-125, PSA, HER2, EGFR) Molecular diagnostics: RT-PCR, qPCR, ELISA, CLIA, electrophoresis, HPLC, LC-MS/MS Clinical bioinformatics: pathway mapping, omics data interpretation 	15	26
	Total Hours:	60	



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Textbook:

1. *Harper's Illustrated Biochemistry* – Rodwell
2. *Medical Biochemistry* – Marks & Marks

Reference Books:

1. *Clinical Biochemistry: Techniques & Interpretations* – Bishop
2. *Tietz Textbook of Clinical Chemistry and Molecular Diagnostics*
3. *Vasudevan: Biochemistry for Medical Students* (Advanced sections)

Course Outcomes:

No.	Course Outcome	RBT Level*
1	Interpret biochemical mechanisms underlying major human diseases	RM, UN
2	Evaluate enzyme activity and metabolic alterations for clinical diagnosis	UN, AP
3	Correlate laboratory biochemical findings with clinical conditions	AP, AN
4	Apply biochemical, molecular & analytical tools in medical diagnostics	AP, AN
5	Integrate biochemical, endocrine and immunological pathways for disease understanding	AN, EL

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List:

1. Estimation of serum glucose & lipid profile
2. Liver and kidney function tests — clinical interpretation
3. Enzyme assays: ALP, LDH, CPK, amylase
4. Estimation of CRP (inflammatory marker)
5. Serum protein or hemoglobin electrophoresis
6. ELISA for disease biomarkers
7. SDS-PAGE & Western blot
8. Demonstration of qPCR
9. Analysis of biochemical pathways using KEGG / Reactome
10. Molecular docking of drug–enzyme interaction (AutoDock / SwissDock)