Name of the Programme: M.Sc. Biotechnology

Course Code: GBT-521

Title of the Course: CONCEPTS IN BIOCHEMISTRY

Number of Credits: 2

Effective from AY: 2022-23

Pre-requisites for the Course:	No prerequisite is required.	
Course Objectives:	The primary objective of this course is to 1)build upon the knowledge of basic biochemical principles with an emphasis on different metabolic pathways and their integration. 2)understand the structure-function relationships of biomolecules.	
Content:	**MODULE I** • Biochemistry: the molecular logic of life. • Amino acids, proteins, nucleic acids, carbohydrates, and lipids. • Vitamins and hormones. • Forces that stabilize biomolecules: electrostatic and Vander Waal's interaction, hydrogen bonding. Interactions with solvents, Hydrophobic effect. • Basic Thermodynamics: Laws of thermodynamics. Concepts of ΔG, ΔH, and ΔS. • Chemical kinetics: Concepts of Order and molecularity of a chemical reaction. Derivation of first and second-order rate equation, measurement of rate constants. Concept of activation energy. • Enzymology: Introduction and classification of enzymes. Types of enzymatic reaction mechanisms, Enzyme kinetics, enzyme inhibition, Regulatory enzymes. Isozymes, Zymogen and Ribozyme. Examples of enzymatic reactions.	**No. of hours** 15

	MODULE II • Basic concepts and design of metabolism - glycolysis, gluconeogenesis • Pyruvate oxidation, Citric acid cycle • Oxidative phosphorylation; the importance of electron transfer in oxidative phosphorylation; F_1-F_0 ATP Synthase; shuttles across mitochondria; regulation of oxidative phosphorylation, inhibitors of electron transport chain. • Glyoxylate cycle • The pentose phosphate pathway • Fatty acid synthesis, β-oxidation; biosynthesis of membrane lipids and sterols with specific emphasis on cholesterol metabolism and the mevalonate pathway • Amino acid metabolism; nucleotide metabolism • Photosynthesis and photorespiration	15
Pedagogy:	Lectures, tutorials, assignments.	
References/ Readings:	1. E. E. Abali, S. D. Cline, D. S. Franklin, S. M. Viselli, Lippincott Illustrated Reviews: Biochemistry Wolters Kluwer publisher, 2021. 2. R. L . Miesfeld, M. M. McEvoy, Biochemistry. Worldwide publisher, 2020. 3. R.K. Murray, et al. Harper's Illustrated Biochemistry McGraw Hill publisher, 2022. 4. D.L. Nelson, Lehninger Principles of Biochemistry. W.H. Freeman & Co., 2017. 5. D. Papachristodoulou, A. Snape, W. H. Elliott, and D. C. Elliott, Biochemistry and Molecular Biology. Oxford University publisher, 2018. 6. L. Stryer, J. Berg, J. Tymoczko, G.Gatto. Biochemistry New York, Freeman publisher.,2019. 7. D. Voet, J.G. Voet, W.P.Charlotte, Principles of Biochemistry. Wiley publisher, 2012. 8. D. Voet, J.G. Voet, W.P.Charlotte, Fundamentals of Biochemistry. Life at the molecular level. Wiley publisher, 2018.	
	The students will be able to:	

Course Outcomes:	1. gain fundamental knowledge in biochemistry 2. draw molecules and reaction mechanisms perfectly. 3. acquire knowledge of biomolecules and their significance 4. understand the role of enzymes in the regulation of metabolic pathways.

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