FACULTY OF SCIENCE AND HUMANITIES

M.Sc. (Biotechnology/Microbiology) (Semester-1)

In Effect from Academic Year 2021-22

Subject Code: 2SC2000101	**Subject Title: Biomolecules and Enzymology**
COURSE TYPE: CORE COURSE	

Course Objective: Living systems are based on the functions of various biochemical reactions that are basically based on biomolecules like, carbohydrates, lipids, proteins and nucleic acids. The students will learn the fundamental aspects of such biomolecules by opting for such course. Enzymes are the lifeblood of any biological processes. It is inevitable for student of any branch of biology to understand the role of these biocatalysts. This course covers in-depth study of Enzymes, their classification, Kinetic studies, their production and applications in various sectors.

Teaching scheme (hours) per week		**Credit**			**Theory Marks**		**Practical Marks**		**Total**
Theory	**Practical**	**Theory**	**Practical**	**Total**	**Uni. Assessment**	**Cont. Assessment**	**Uni. Assessment**	**Cont. Assessment**	
4	**-**	**4**	**-**	**4**	**60**	**40**	**-**	**-**	**100**

Unit	**Content**	**Lectures**	**Weightage**
1	**Carbohydrate:** Isomerism, Mucopolysaccharides, proteoglycans, glycolipids and blood group polysaccharides **Lipids:** Classification of fatty acids, structure and functions of lipoproteins, cholesterol, steroids and prostaglandins, membranes **Nucleic Acids:** Chemical structure of nucleotides Unusual Nucleotides, Chargaff's rules, Double helical structures: Watson-Crick Model (B-DNA), Deviations from Watson-Crick Model: Other DNA helices (A-& Z-DNA), Structure of m-RNA, r-RNA & t-RNA	**15**	**25%**
2	**Proteins:** Classification of amino acids; Primary, secondary, tertiary and quaternary structure of proteins. Determination of protein structure and its analysis, Ramachandran plot **Enzymology** Introduction to enzymology and historical developments in enzymology, techniques used in enzyme characterization Enzyme classification: IUB enzyme classification Enzyme Activity: Principle and techniques of enzymatic analysis, factors affecting enzyme Activity, Extraction and Purification of enzyme: Objectives and strategy, separation techniques, test of purity	**15**	**25%**
3	Enzyme Kinetics: Bioenergetics and Catalysis Single substrate kinetics: Equilibrium and Steady state kinetics, significance of Km, Vmax & Kcat. Pre steady state and Relaxation kinetics Multisubstrate kinetics: General rate equation, compulsory order, random order and ping-pong mechanisms and their primary and secondary plots Enzyme inhibition and its kinetics: Reversible (competitive, noncompetitive and uncompetitive, mixed, partial, substrate and allosteric inhibition) and irreversible inhibition.	**15**	**25%**
4	Mechanism of Enzyme Action: Enzyme activators, co-enzymes and co-factors in enzyme catalysis, Enzyme and substrate specificity, Investigation of active Centre, Factors affecting catalytic efficiency, Experimental approaches to determine enzyme mechanisms	**15**	**25%**

	Isoenzymes and its physiological significance, Ribozymes and Abzymes. Immobilization of Enzyme , Enzymes sensors, Enzymes as analytical reagents.		

Learning Outcome: Students will learn the basics of enzyme activity & enzyme kinetics. They will also learn the fundamental concepts underlying the production & applications of various enzymes employing SSF or SmF Techniques. Fundamental processes of life are governed by various metabolic reactions involving carbohydrates, lipids, proteins and Nucleic acids. The students will get in-depth knowledge of such processes by offering this course.

LIST OF TEXTBOOKS:

- Lehninger's Principles of Biochemistry- D.L.Nelson and M.M.Cox
- Biochemistry: L Stryer
- Biochemistry – U Satyanarayan
- Fundamentals of Enzymologist: Nicholes C. Price and Lewis Stevens, Oxford Univ. Press.
- Enzyme Structure and mechanism: Alan Fersht, Reading, USA.
- Understanding Enzymes: Trevor Palmer
- The chemical kinetics of enzyme action: K. J. Laider and P. S. Bunting, Oxford University Press, London.
- Biochemistry by cohn and stumph