Master of Science
M Sc Microbiology Semester III

Course Code	PS02CBIT52	Title of the Course	Enzyme Technology
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	1.Understanding of basics properties of enzymes 2.Understand factors influencing enzymes and their reaction kinetics 3. Understand the Industrial applications of enzymes and their engineering and computational methods to understand properties and working of enzymes

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction to Enzymology&Practical Enzymology** Introduction and historical developments in enzymology Protein Structure: Primary, secondary, tertiary and quaternary structure, techniques used in enzyme characterization Enzyme nomenclature and classification, Characteristics, chemical nature and properties of enzymes, enzyme specificity and rate enhancement. Enzyme Activity, assay methods, factors affecting enzyme activity, progress curve, enzyme activators, coenzyme and cofactors. Enzyme purification: Objectives and strategy, separation techniques, test of purity, case study	25
2.	**Enzyme Kinetics (Single substrate and Multi-substrate)** Chemical reaction kinetics and catalysis Single substrate kinetics: Equilibrium and Steady state kinetics, significance of Km, Vmax&Kcat, enzyme efficiency. Multisubstrate kinetics: General rate equation, compulsory order, random order and ping-pong mechanisms and their primary and secondary plots. Oligomeric enzymes and sigmoidal kinetics Enzyme inhibition and its kinetics: Reversible and irreversible inhibition, competitive, non-competitive and uncompetitive, mixed, partial, substrate inhibition. Thermal kinetics: Effect of temperature on reaction rate, enzyme stability, Arrhenius equation and activation energy.	25
3.	**Enzyme technology I** Industrial enzymes:Production strategies and downstream processing of industrial enzymes.	25

	Enzyme Immobilization, Immobilized enzyme reactors Applications of enzymes in diagnostics, as analytical agents, as therapeutic agents, Industrial applications of various enzymes. Business of enzymes in India and world	
4.	**Enzymes Technology II** Enzyme engineering: Structure function relationship, Methods of enzyme alterations, examples of engineered proteins. Enzymes in non conventional media, Isoenzymes and its physiological significance, Ribozymes and Abzymes enzyme sensors Design and Construction of novel enzymes Enzyme Computational Biology: Databases and tools for viewing and analysis of structures, comparing structures, locating active site and understanding mechanisms.	25

Teaching-Learning Methodology	Topics will be taught and discussed in interactive sessions using conventional black board and chalk as well as ICT tools such as power point presentations and videos. Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure. Course materials will be provided from primary and secondary sources of information.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learnerwill be able to	
1.	Appreciate the versatility of enzymes in the living systems, their properties and working
2.	Handle and work with enzymes to understand in depth their kinetics, mechanisms and their regulatory roles.
3.	Understand The market potential and economics of enzyme production.
4	Get trained and work with the applications of enzymes in industries, therapeutics and other sectors and also the role of engineered enzymes Appreciate the significance of isoenzymes, abzymes and ribozymes

Suggested References:	
Sr. No.	References
1.	The chemical kinetics of enzyme action: K. J. Laider and P. S. Bunting, Oxford UniversityPress, London.
2.	Enzyme Structure and mechanism: Alan Fersht, Reading, USA.
	Understanding Enzymes: Trevor Palmer
	Fundamentals of Enzymology: Nicholes C. Price and Lewis Stevens, Oxford Univ. Press.
	Enzymes: M. Dixon, E. C. Webb, CJR Thorne and K. F. Tipton, Longmans, London
	Enzyme Technology: Anusha Bhaskar and V.G. Vidhya, MJP Publishers, Chennai, India.
	Enzymes:, Catalysis, Kinetics and Mechanisms, By N.S. Punekar. Springer nature publications, Singapore
	ENZYME KINETICS A Modern Approach by Alejandro G. Marangoni. John Wiley & Sons, Inc., Hoboken, New Jersey.
	Proteins: Thomas Creighton
	Biochemistry: Lubert Stryer.

	Enzymology, T Devasena, Oxford Publication

On-line resources to be used if available as reference material
On-line Resources:
https://www.expasy.org/
https://www.ncbi.nlm.nih.gov/

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