

ENZYME TECHNOLOGY

Semester	Subject Code	Category	Lecture		Theory		P	C
II	21CPBT2B	Core - V	4 hrs per week	60	4 hrs per week	60	0	4

COURSE OBJECTIVES:

- The objective of the course is to endow with a deeper approaching into the fundamentals of enzyme structure, functions, kinetics of immobilized enzyme, applications and future prospective of enzymes.

COURSE OUTCOMES: By the end of this course, students will able to:

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K4)
CO1	To understand the basic concepts of enzyme structure and its functions	K2
CO2	Understand the enzyme kinetic reactions and enzyme inhibition studies	K2
CO3	To learn, analyze and apply various immobilization and purification techniques.	K3, K4
CO4	To learn and understand the various methods of enzyme catalysis	K2
CO5	Apply and identify the uses of enzyme technology with current applications in a diverse range of industries.	K1, K3

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	M	M	M
CO2	S	M	S	M	M	S
CO3	S	S	M	M	M	S
CO4	M	M	S	M	M	S
CO5	M	S	S	S	M	S

S-strong; M- medium; L-low

UNIT - I

Introduction to enzymes

10 Hours

Nomenclature and classification of enzymes, enzyme units, katal and IU, enzyme activity, chemical nature of enzymes, enzyme structure and properties (specificity, co-factors, Co-enzyme, apoenzyme, isoenzyme and prosthetic groups), Mechanism of action of enzymes and free energy changes.

UNIT - II

Enzyme Kinetics

12 Hours

Henri-Michaelis-Menten equation and Briggs Haldane hypothesis, Lineweaver-Burk plot. Enzyme inhibition: reversible (Competitive, Non-competitive and Un-competitive) and irreversible inhibition. Substrate and product inhibition. Negative feedback inhibition, allosterism/or allosteric enzyme.

UNIT - III

Enzyme immobilization, purification and characterization

13 Hours

Physical and Chemical Techniques for Enzyme Immobilization – Adsorption, Matrix Entrapment, Encapsulation, Cross-Linking, Covalent Binding and Suitable Examples – Advantages and Disadvantages of immobilized enzymes.

Production and purification of crude enzyme extracts from plant, animal and microbial sources. Methods of enzyme characterization: Effect of pH, temperature, substrate, detergents, metal ions.

UNIT – IV

Enzyme Catalysis

13 Hours

Enzyme catalysis: General principles, Lock and key model, Induced fit model, Mechanism of enzyme catalysis: acid-base catalysis, covalent catalysis, metal ion catalysis, proximity and orientation, preferential binding of the transition state, mechanism of serine protease - chymotrypsin, Lysozyme, carboxypeptidase A and Ribonuclease.

UNIT – V

Applications and future trends of enzymes

12 Hours

Biocatalysis - Advantages and disadvantages. Applications of enzymes in food, pharmaceuticals, medicine and diagnostics, synthesis of antibiotics, production of therapeutics and fine chemicals using biocatalysis.

Distribution of Marks: Theory 80% and Problems 20%

TEACHING METHODOLOGY:

- Class room teaching
- Assignments
- Discussions
- Homework
- PPT presentations

- Seminars
- Models and charts

TEXT BOOKS:

S.no.	Authors	Title	Publishers	Year of publication
1.	A. Pandey., C.Webb., C.R. Soccol and C.Larroche	Enzyme Technology	Springer	2006
2.	K.Buchholz., V. Kasche and U. Bornscheuer	Biocatalysts and Enzyme Technology	WILEY-VCH	2005

REFERENCE BOOKS:

S.no.	Authors	Title	Publishers	Year of publication
1.	Blanch, H.W., Clark, D.S.	Biochemical Engineering,	Marcel Dekker	2015
2.	Wiseman, Alan.	Hand Book Of Enzyme Biotechnology, 3 rd Edn.,	Ellis Harwood	2006
3.	Nicoles C Price and Lewis Stevens	Fundamentals of Enzymology	Oxford Univ. Press.	2005

WEB SOURCES:

1. <http://www.biologydiscussion.com/enzymes/enzymes-properties-and-mechanism-of-enzyme-action/6145>
2. <http://www.biology-pages.info/E/EnzymeKinetics.html>
3. <https://www.easybiologyclass.com/enzyme-cell-immobilization-techniques/>
4. <https://nptel.ac.in/courses/103103026/36>
5. <http://cyber.scihub.tw/MTAuMzEwOS8wNzM4ODU1MS4yMDE0Ljk1MDU1MA=/10.3109%4007388551.2014.950550.pdf>

Syllabus Designer:

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