

## ENZYMOLGY

Sem	Sub. Code	Category	Lecture		Theory		Practical		Credits
			Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	
II	21CPBC2A	Core	3	45	3	45	-	-	3

### COURSE OBJECTIVE:

- To understand the classification of enzymes and fundamentals of enzyme assay. Also, understanding of kinetics of enzyme catalyzed reactions and derivation of MichaelisMenten equation.
- To advance the knowledge on mechanism of enzyme action as well as regulation of enzyme action with relevant examples.
- To study about the techniques of immobilization and application in enzymes in food and pharmaceutical industries.

### COURSE OUTCOMES:

On the successful completion of the course, the students will be able to,

CO Number	CO Statement	Knowledge Level (K <sub>1</sub> – K <sub>4</sub> )
CO1	Course material will help in understanding of nomenclature and classification of enzymes and also the fundamentals of enzyme assay.	K1
CO2	Students will thoroughly understand the Kinetics of enzyme essay and derivation of velocity equations.	K2
CO3	Course will advance the knowledge of students on mechanism of enzyme action.	K2
CO4	Understanding of detailed mechanism in enzyme regulation with relevant examples.	K3
CO5	Students will gain knowledge in various immobilization techniques and industrial and therapeutic application of enzymes	K4

(\*CO – Course Outcomes

Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze).

### MAPPING WITH PROGRAMME OUTCOMES:

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

(S- Strong; M-Medium; L– Low)

## **UNIT I**

### **Enzymes**

**5 Hours**

Introduction to Enzymes - Nomenclature and classification of enzymes, enzyme units, Specificity and active site, Intracellular location of Enzymes, Determination of active site, Extraction, Purification and characterization of enzymes. Zymogen activation, Antioxidant enzymes, Isoenzymes, multienzyme complex - Structure and Mechanism of action of PDH and FAS, ribozymes

## **UNIT II**

### **Enzymes Kinetics and enzyme inhibition**

**10 Hours**

Enzyme Kinetics - Steady state theory, MM Equation, significance of  $K_m$  and  $V_{max}$ , LB Plot, EadieHofstee Plot, Briggs - Hanes Plot. Factors affecting enzyme activity, kinetics of multisubstrate enzymes - Types of kinetic mechanisms for bi-substrate reactions – sequential and ping-pong. Metalloenzymes and Metal - activated Enzymes. Reversible and irreversible enzyme inhibition.

## **UNIT III**

### **Mechanism of Enzyme activity and Co-enzymes**

**10 Hours**

Mechanism of Enzyme Action – Acid-base catalysis, covalent catalysis, proximity, orientation effect. Strain & distortion theory. Chemical modification of active site groups. Site directed mutagenesis of enzymes. Structure and mechanism of action of chymotrypsin, lysozyme, carboxypeptidase. Vitamin and non-vitamin co-enzymes – structure and biochemical functions of NAD, FAD, TPP, PLP, Biotin and CoA.

## **UNIT IV**

### **Enzyme Regulation and Cooperativity**

**10 Hours**

Enzyme Regulation–General mechanisms of enzyme regulation, product inhibition. Reversible (glutamine synthase & phosphorylase) and irreversible (proteases) covalent modifications of enzymes. Mono cyclic and multicyclic cascade systems with specific examples. Feed back inhibition and feed forward stimulation. Allosteric enzymes, qualitative description of “concerted” & “sequential” models for allosteric enzymes. Half site reactivity,

Flipflop mechanism, positive and negative co-operativity with special reference to aspartate transcarbamoylase & phosphofructokinase. Regulation of enzyme activity by proteolytic cleavage.

## **UNIT V**

### **Applications of enzymes**

**10 Hours**

Application of enzymes in food, pharmaceutical, pulp, textile and other industries; diagnostic & therapeutic applications. Immobilized enzymes - Techniques of enzyme immobilization; applications of immobilized enzymes. Enzymes as Biosensors - Calorimetric, Amperometric, Optical and Immuno biosensors. Enzyme Engineering: Artificial enzymes. Future prospects of Enzyme engineering. Abzymes.

**DISTRIBUTION OF MARKS:** Theory - 100% and Problems – Nil

### **TEACHING METHODOLOGY:**

- Black Board
- Power Point Presentations
- Assignments
- Models
- Demonstrations

### **TEXT BOOKS:**

<b>S.NO</b>	<b>AUTHORS</b>	<b>TITLE</b>	<b>PUBLISHERS</b>	<b>YEAR OF PUBLICATION</b>
1	S.M. Bhatt	Enzymes and Enzyme Technology	Chand Publishing	2004
2	T. Devasena	Enzymology	Oxford University Press	2003

**REFERENCE BOOKS:**

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	Trevor Palmer	Enzymes	West Press Pvt. Ltd	2004
2	Dixon , E.C Webb, CJR Thorne and K.F. Tipton, Longmans	Enzymes	Academic Press	2002
3	Nicholas C.Price, Lewis Stevans.	Fundamentals of Enzymology	Oxford University Press	1998
4	Trevor Palmer	Understanding Enzymes	Ellis Horwood Limited.	1991
5	Boyer	The Enzymes	Academic Press	1982

**WEB SOURCES:**

- [http://www.biology.arizona.edu/cell\\_bio/cell\\_bio.html](http://www.biology.arizona.edu/cell_bio/cell_bio.html)
- [https://ecok.libguides.com/biology/web\\_sources](https://ecok.libguides.com/biology/web_sources)
- <https://www.nicholls.edu/biol-ds/biol155/Lectures/Cell%20Biology.pdf>
- <http://www.bio-nica.info/Biblioteca/Bolsover2004CellBiology.pdf>

**SYLLABUS DESIGNER:**

- Dr.V. Prabha, Head & Assistant Professor of Bio-Chemistry
- Ms.T. Nalini, Assistant Professor of Bio-Chemistry