

## 17BT003- ENZYME TECHNOLOGY

### Hours Per Week:

L	T	P	C
3	-		3

### Total Hours:

L	T	P
45	-	-

BS	SA	CS	W/RA	SSH	S
5	8	1-5	5	40	1-5

### ***Course Description and Objectives:***

*This course offers an introduction to enzymes and their functions. The main purpose of this course is to explore various aspects of enzymes such as their classification, mechanism of action, isolation methods and kinetics.*

### ***Course Outcomes:***

*The student will be able to:*

- *Describe various classes of enzymes, their active sites and energetics of enzyme - substrate complex.*
- *Gain knowledge on key structural and energetic factors of enzyme stability.*
- *Summarize current processes involved in industrial enzyme production from plants, animals and microorganisms.*
- *Understand the different immobilization methods and analyze the bioconversions in immobilized reactors.*

### **SKILLS:**

- *Isolate commercially important enzymes.*
- *Estimate enzyme activity by colorimetric and spectroscopic methods.*
- *Immobilize enzymes for commercial applications.*

### **ACTIVITIES:**

- *Isolate amylase/ peroxidase/ urease from various sources.*
- *Purify the enzyme by different methods.*
- *Estimate  $K_M$  and  $V_{max}$  of different enzyme reactions.*
- *Immobilize peroxidase on various substrates cloth, fabric, glass bead and encapsulation.*

## **UNIT –I**

**L- 09**

**INTRODUCTION TO ENZYMES:** Discovery of enzymes - a historical recall; Classification of enzymes; Applications of enzymes; Principles of catalysis - collision theory, transition state theory, role of entropy in catalysis; Comparison of chemical and enzyme catalysis; Stability, deactivation and catalytic activities; Mechanisms of enzyme action; Concept of active site and energetics of enzyme substrate complex formation; Specificity of enzyme reaction.

## **UNIT -II**

**L- 09**

**ISOLATION OF ENZYMES:** Extraction and purification of crude enzyme extracts from plant, animal and microbial sources; Methods of characterization of enzymes; Development of enzymatic assays.

## **UNIT - III**

**L- 09**

**KINETICS OF ENZYME ACTION:** Kinetics of single substrate reactions; Estimation of Michaelis - Menten parameters; Importance of  $K_m$ ; Multi-substrate reaction mechanisms and kinetics; Turnover number; Types of Inhibition - kinetic models, substrate and product inhibition; Allosteric regulation of enzymes; Deactivation kinetics.

## **UNIT - IV**

**L- 09**

**ENZYME IMMOBILIZATION:** Physical and chemical techniques for enzyme immobilization - adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding; Advantages and disadvantages of different immobilization techniques; Overview of applications of immobilized enzyme systems.

## **UNIT - V**

**L- 09**

**IMMOBILIZED ENZYME REACTORS:** Design of immobilized enzyme reactors- packed bed, fluidized bed membrane reactors; Bioconversion calculations in free enzyme CSTRs and immobilized enzyme reactors; Stability, deactivation and catalytic activities.

### **TEXT BOOKS:**

1. T. Palmer, "Enzymes", 1st edition, East West Press, 2004.
2. N.K. Prasad, "Enzyme Technology - Pace Maker of Biotechnology", 1st edition, PHI publishers, 2011.

### **REFERENCEBOOK:**

1. Devasena, "Enzymology", 1st edition, PHI, 2011.