

20BT006**BIOCHEMISTRY AND ENZYME TECHNOLOGY**

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	-	45	-	-	-	-	-	-

Course Description and Objectives:

- To gain insight on the function of different biomolecules in the cell.
- To understand how cell receive and generate signals.
- To gain understanding of metabolism.
- To obtain deeper insight in the fundamentals of enzyme structure and function, and the relation between these two.
- To understand the kinetics of enzyme and how it is affected.

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- Apply knowledge of biomolecules to explore their functions.
- Understand the modes and mechanisms of signalling.
- Appraise the role of biomolecules in metabolism.
- Differentiate various classes of enzymes, their active sites and energetics of enzyme – substrate complex.
- Gain knowledge on key structural and energetic factors of enzyme stability.

SKILLS:

- ✓ Identifying roles of various biomolecules in cell regulation and metabolism.
- ✓ Ability to design enzymatic reactions and analyse inhibitions.
- ✓ Ability to understand and explore the state-of-art methods adopted to improve enzyme efficiency.

ACTIVITIES:

- o Estimate carbohydrate content in various cereals (rice, maize, wheat) used in regular diet.
- o Compare peroxidase activity of crude extracts from five seasonal fruits and vegetables.

Unit-I

Biomolecules: Water; Structure and function of biomolecules: carbohydrates, lipids, proteins and nucleic acids; Protein purification; Protein folding and Cellular folding with chaperones.

Unit-II

Signalling: Biophysics of cell membranes and membrane proteins; Molecular recognition and specificity; Protein-protein interactions; Signal transduction.

Unit-III

Metabolism: Overview of metabolism; ATP as energy currency; Intermediary metabolism; Metabolic integration; Role of vitamins in the metabolism.

Unit-IV

Basic Enzymology: Classification and Mechanisms of enzyme action; Concept of active site and energetics of enzyme substrate complex formation; Specificity of enzyme reaction. Kinetics of single substrate reactions; Estimation of Michaelis - Menten parameters; Importance of Km; Multi-substrate reaction mechanisms and kinetics; Turnover number; Types of Inhibition - kinetic models, substrate and product inhibition; Allosteric regulation of enzymes; Deactivation kinetics.

Unit-V

Enzyme Engineering: Enzyme Engineering and site directed mutagenesis; Prediction of enzyme structure; design and construction of novel enzymes, Bifunctional and polyfunctional enzyme; Lead Compound; Structure based drug design.

LABORATORY EXPERIMENTS**Laboratory Experiments**

Total hours: 30

1. Determination of total protein
2. Determination of total carbohydrate
3. Determination of crude fat by Soxhlet method
4. Determination of crude fibre
5. Estimation of kinetic parameters of the enzyme
6. Effect of temperature, pH and ionic concentration on enzyme activity
7. Inhibition studies on the enzyme
8. Thermal and chemical denaturation of enzyme

Text Books

1. Voet D., Voet J.G, Biochemistry 4 th Edition., John Wiley and Sons, 2011.
2. Nelson, D. C. and Cox, M.M., Lehninger Principles of Biochemistry, 5 th Edition, W. H. Freeman, 2010.
3. Berg J.M., Tymoczko J.L. and Stryer L., Biochemistry. 7th edition, W.H. Freeman and Co. New York, 2011.

Reference Books

1. Fundamentals of Enzymology : Nicholas Price & Lewis Stevens
2. Enzymes : Biochemistry, Biotechnology and Clinical Chemistry- Trevor Palmer
3. Creighton TE, Protein-Structure and Molecular Properties, W.H. Freeman and Co. (1997)