

th Semester	RBT4C002	Enzyme Technology	L-T-P 3-0-0	3 CREDITS
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**Module-I: INTRODUCTION TO ENZYMES (10 Hrs.)**

Introduction and definition of enzymes; Nomenclature and Classification of enzymes; concept of active site and energetics of enzyme substrate complex formation; Mechanisms of enzyme action, – General catalysis and acid base catalysis principles of catalysis – collision theory and transition state theory; Enzymes in organic solvents; Introduction to enzyme activity and specific activity. Enzyme Production: Enzyme sources, synthesis, recovery, purification, and formulation of enzymes,

**Module-II: KINETICS OF ENZYME ACTION (10 Hrs.)**

Kinetics of single substrate reactions - Michelis – Menten equation and Briggs Haldane equation; Estimation of Michelis – Menten parameters – Lineweaver-Burk plot, Bisubstrate reactions – single displacement and ping pong mechanism; multi substrate reactions- King and Altmann equation; types of inhibition– Competitive, Uncompetitive, non-competitive and substrate; Allosteric regulation of enzymes - Monod-Changeux-Wyman model, Koshland–Nemethy-Filmer model.

**Module-III: ENZYME IMMOBILIZATION AND CATALYSIS (09 Hrs.)**

Physical and chemical techniques for enzyme immobilization – adsorption, matrix entrapment, encapsulation, cross-linking and covalent binding; Applications of immobilized enzymes. Heterogeneous Enzyme Kinetics: mass transfer effects in heterogeneous biocatalysis, partition effects, external (film) diffusion, internal (pore) diffusion,

**Module-IV: DESIGN OF REACTORS (08 Hrs.)**

Enzyme Reactors: Design of ideal reactors with enzymes (Batch, CSTR, PFR), effect of diffusion on enzyme reactor design, effectiveness factor, effect of thermal inactivation and mass transfer limitation on design and performance of enzyme reactors

**Module-V: APPLICATIONS OF ENZYMES (08 Hrs.)**

Application of enzymes in industries– Food, detergent, leather and wool, brewery and environment, chemicals processing ; Enzyme electrodes and their application as biosensors in various industries – Calorimetric, potentiometric, amperometric, optic and immunosensors.

**Books:**

- “Enzyme Biocatalysis: Principles and Applications’ by A.Illanes, Springer
- “Enzyme Technology” by M.F.Chaplin and C.Bucke, Cambridge University press, 1990. (Website for the book, [www.lsbu.ac.uk/biology/enztech/](http://www.lsbu.ac.uk/biology/enztech/))
- “Biocatalysts and Enzyme Technology” by K. Buchholz,V. Kasche and U.T. Bornscheur, Wiley,2005

- “Enzyme Technology”, by Shanmugam,S. and Satish Kumar,T.,IK International Pvt. Ltd, New Delhi, 2008
- “Biochemical Engineering Fundamentals’ by Bailey,J.E., and Ollis,D.F., McgrawHill,1986.
- “Bioprocess Engineering”, 2nd edition, by Shuler and Kargi, Prentice-Hall