



**Enzyme Engineering and Technology**  
**MBT3006**

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**Course Objective:** This course is designed to equip the students with Advance knowledge of Enzyme Kinetics, Optimization and modeling of Enzyme Systems. Students will be able to design enzymatic process, after the completion of the course.

**Learning Outcome:** After the completion of this course students will be able to analyze the data obtained for enzymes, appreciate the utility of enzymes in various industries. They will be able to design new enzymes for future.

**UNIT I: Properties of Enzymes**

Introduction, nomenclature and scope of Enzymes. Mechanism of enzyme action, concept of ES complex, Active sites. Specificity of enzymes, Enzyme UNITS and turn over number.

**UNIT II: Enzyme Kinetics**

Order of reactions, kinetics of enzyme reactions- single, bi substrate reactions. Michaelis- Menten Equation. Estimation of  $K_m$  and  $V_{max}$  and their physiological significance. Allosteric enzymes, their role in controlling metabolic pathways.

**UNIT III: Enzyme Immobilization**

Physical and chemical techniques for enzyme immobilization- adsorption, matrix-entrapment, encapsulation, cross linking and covalent bonding *etc.* Advantages and disadvantages of enzymes immobilization. Temperature dependence of enzymatic rate constant, thermal deactivation. pH dependence of enzymes- ionization of acids and bases.

**UNIT IV: Isolation, Purification and Characterization of Enzymes:**

Isolation, purification and characterization of enzymes. From natural sources. Preparation of purification chart once the purification is done. Different methods of enzyme characterization- SDS-PAGE, 2-D *etc.* Case studies and discussion on the research papers based on enzyme isolation.

**UNIT V: Industrial Applications of Enzymes**

White Biotechnology: Examples of enzyme applications in industrial process, production of drugs and fine chemicals. Enzyme based Biosensors. Enzymes in organic catalysis. Enzyme Engineering, site

directed mutagenesis and other methods of enzyme production. *In vitro* methods of enzyme modifications by protein expression.

**TEXT BOOKS:**

1. Voet and Voet (1990) Biochemistry John Wiley & Sons, New York
2. Palmer T and Bonner TL (2007) Enzymes: Biochemistry, Biotechnology and Clinical Biochemistry,

**REFERENCE BOOKS:**

1. Jeremy Mark Berg, John L., Tymoczko and Stryer L., (2002) Biochemistry WH Freeman New York
2. Harrison R. G., Todd P., Rudge S. R. (2003) Bioseparation Science and Engineering, Oxford Press, Oxford.