SARDAR PATEL UNIVERSITY
Programme: MSC (Integrated Biotechnology)
Semester: V
Syllabus with effect from: June 2012

Paper Code: PS05CIGB01	**Total Credits: 3**
Title Of Paper: Enzymology	

Unit	Description in detail	Weightage (%)
1	**An Introduction to enzymes:** What are enzymes, brief history of enzymes, concepts of coenzymes, cofactors, holoenzymes, apoenzyme, activators, inhibitors, regulatory enzymes. Specificity of enzyme (active site) and models for enzyme specificity (Lock and key, induced-fit and transition-state stabilization hypothesis). Metal-activated enzymes and metalloenzymes (alkali metal cations, alkaline earth metal cations and transition metal cations). Role of cofactors in enzyme catalysis with suitable examples: NAD/NADP (eg. alcohol/lactate dehydrogenase), FMN/ FAD (glutathione reductase) and role of vitamin as coenzymes. Unisubstrate reaction and Bi substrate reactions briefs introduction to sequential and ping pong mechanisms with examples	
2	**Methods for isolation and purification of enzymes:** Methods for homogenization of tissue, Method for protein purification depend on size (centrifugation, gel filtration, dialysis and ultrafiltration), Method for protein purification depend on polarity (ion-exchange chromatography, electrophoresis, isoelectric focusing, hydrophobic interaction chromatography), Method for protein purification depend on changes in solubility (change in pH, change in ionic strength, decrease in dielectric constant), Method for protein purification depend on possession of specific binding sites or structural features (affinity chromatography, affinity elution, dye-ligand chromatography, immunoadsorption chromatography and covalent chromatography)	
3	**Enzyme kinetics:** Concept of activation energy for uncatalyzed and catalyzed (chemical and enzyme) reaction. Type of reaction (zero-order, first-order and second order). Unisubstrate enzyme kinetics; factors affecting the rate of enzyme catalyzed reactions forms and derivation of Michaelis-Menten equation; significance of $V_{max,}$ K_m and different plots (Lineweaver-Burk, Eadie-Hofstee and Hanes plots). Enzyme inhibition and kinetics – type of inhibition (reversible and irreversible), competitive, non competitive, uncompetitive, mixed, partial, substrate, and allosteric.	
4	**Application of enzymes:** Advantages of enzymes vs. chemical catalysts, Immobilized enzymes and cells: Methods of immobilization, use of immobilized enzymes, advantage and disadvantage of immobilized enzymes. Industrial applications of enzymes. Type of isoenzymes and clinical significance (eg. lactate dehydrogenase, creatine phospho kinase, alkaline phosphatase).	
	Practical:	
	• Estimation of reducing sugar by DNS method • Determination of invertase activity • Effect of enzyme concentration on enzyme catalyzed reaction • Effect of pH on enzyme catalyzed reaction • Effect of temperature on enzyme catalyzed reaction • Effect of time on enzyme catalyzed reaction	

	• Effect of substrate concentration on enzyme catalyzed reaction and determination of Km and Vmax of enzyme • Demonstration of immobilization of enzyme/whole cell using appropriate method	

Basic Text & Reference Books:

- Fundamentals of enzymology, Nicholason price & Stevens ISBN 0-19850-229-X.
- Enzymes by Trevor palmer, Horwood Publishing Limited,ISBN 1-898563-78-0.
- Fundamentals of Biochemistry. D Voet, J.G Voet and C. W. Pratt. John Wiley and Sons, Inc, New York, 3rd Edition.
- Biochemistry. Lubert Stryer. W. H. Freemand and Company. 6th Edition. ISBN- 0716720094.
- Textbook of Medical Biochemistry. Chatterjee M.N and Rana Shinde. Jaypee Brothers Medical Publisher PVT Ltd. ISBN – 8184481349.
- Principles of Biochemistry. Albert Lehninger, W. H. Freeman and Company. 5th Edition. ISBN – 10: 1572591536.
- Harpers's Biochemistry. Harper, Mc Graw Hill Publishing Company. 27th Edition. ISBN – 10: 0071461973