AMITY UNIVERSITY
UTTAR PRADESH

Annexure AAB CD-01

Course Title: Enzymology
Course Code: GCMB 305
Credit Units: 3

L	T	P/S	Lab	TOTAL CREDIT UNITS
2			2	3

Course Objectives:

Theory: The objective of the course is to provide a deeper insight into the fundamentals of enzyme structure and function and kinetics of soluble and immobilized enzymes. Also it deals with current applications and future potential of enzymes.

Practical: To train students in basic studies of enzyme extraction and measurements of their activities.

Pre-requisites: knowledge of biology and chemistry

Student Learning Outcomes:

- The student will be able to describe structure, functions and the mechanisms of action of enzymes.
- The student will learn kinetics of enzyme catalyzed reactions and enzyme inhibitory and regulatory process.
- The student will be able to perform immobilization of enzymes.
- The student will get exposure of wide applications of enzymes and their future potential.

Course Contents/Syllabus- Theory:

	Weightage (%)
Module I : Introduction to enzymes **Descriptors/Topics:** Enzyme structure and properties (specificity, co-factors, and prosthetic groups), Enzyme classification (Enzyme commissions system), Mechanism of action of enzymes and free energy changes. Active site, Enzyme catalysis (acid-base, covalent and metal ion catalysis).	**25**
Module II : Enzyme Kinetics **Descriptors/Topics:** Methods (steady state and continuous assay) of investigating mechanism of enzyme catalyzed reactions, Henri-Michaelis-Menten and Briggs Haldane hypothesis, Lineweaver-Burk plot. King-Altman's procedure for determination of rate of enzymatic reactions. Enzyme inhibition: reversible (Competitive, Non-competitive and Un-competitive) and irreversible inhibition. Substrate and product inhibition. Negative feedback inhibition, allosterism/or allosteric enzyme and sigmoidal kinetics.	**30**
Module III : Enzyme immobilization **Descriptors/Topics:** Parameters of enzyme immobilization, advantages, Carriers (inorganic, organic and synthetic polymers), binding methods (adsorption, covalent binding, cross-linking and entrapment), Micro-environmental effects. Kinetic characterization of immobilized enzymes (determination of Vmax and Kcat, Km and Ki). Applications of immobilized enzyme with relevant examples.	**25**
Module IV : Applications and future trends of enzymes **Descriptors/Topics:** Applications of enzymes in food, pharmaceuticals, medicine and diagnostics. Synthesis of antibiotics, production of therapeutics and fine chemicals. Artificial enzymes/synenzymes.	**20**

Pedagogy for Course Delivery:

Lectures: 42
Home Assignment 1
Class Test: 2
Total: 45

Lab/ Practical details, if applicable:

Practical: 13
Class Test: 02
Total: 15

List of Experiments:

- Extraction enzyme (alkaline phosphatase/ amylase/ esterase) from either plant or microbial source.
- Measurement/assay of enzyme (alkaline phosphatase/ amylase/ esterase) activity in the crude enzyme extract.
- Purification of enzyme extract by dialysis and ammonium sulfate precipitation.
- To examine effect of enzyme concentration on rate of enzyme catalyzed reaction.
- To determine temperature optima for enzyme (alkaline phosphatase/ amylase/ esterase)
- To determine pH optima for enzyme (alkaline phosphatase/ amylase/ esterase)
- To study effect of substrate concentration on enzyme activity for determination K_m and $V_{max.}$
- Enzyme immobilization by absorbance or entrapment method.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
75	25	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment						End Term Examination
Components (Drop down)	Class Test 1	Class Test 2	Home Assignment	Presentation/ Seminar	Attendance	
Weightage (%)	5	10	5	5	5	70

Lab/ Practical/ Studio Assessment:

	Continuous Assessment/Internal Assessment				End Term Examination			Total
Components (Drop down	Performance	Lab record	viva	Attendance	Lab record	Performance	Viva	
Weightage (%)	10	10	5	5	10	50	10	100

Text:

1. Enzymes: Biochemistry, Biotechnology and Clinical Chemistry. Trevor Palmer. Affiliated East-West Press Pvt Ltd. , New Delhi, India.
2. The Nature of Enzymology, R.L. Foster, Croom Helm, London.
3. Fundamental of Enzymology, Nicholas C. Price and Lewis Stevens, Oxford University Press, Oxford.
4. Introductory Practical Biochemistry. S.K. Sawney and R. Singh (2000). Narosa Publisher
5. Plummer DT "An Introduction to Practical Biochemistry" III Edn., Tata McGrawhill.

References:

1. Biocatalyst and Enzyme Technology, K Buchholz, V. Kasche, and U.T. Bornscheuer. Willey-VCH Verlag GmbH and Co. Germany.
2. Enzyme Kinetics: Behavior and Analysis of Rapid Equilibrium and Steady State Enzyme Systems, I.H. Segel, Wiley-Interscience

3. Enzyme Technology, M.F. Chaplin and C. Bucke, Cambridge University Press.

Any other Study Material: