Subject Code: 2MB0407

Subject Name: Enzymology

M. Sc. Semester - I

Objective: To impart the knowledge of and mechanisms of enzymes and their industrial and medical application.

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, student will be able to

1. Differentiate the function and mechanisms of various enzymes.
2. Analyse and design various enzymatic assays and study the impact various activators and inhibitors.
3. Optimize condition for enhanced enzyme activity.
4. Devise suitable strategies to apply the knowledge of enzymology for medical and industrial applications.

Pre-requisite of course: Biochemistry and Cell Biology.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE(I)	Viva (V)	Practicals/ TW	
5	0	2	6	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	**Introduction to Enzymes** Laws and principles of thermodynamics and their importance in enzyme catalysis. Historical perspective of enzymes and their importance in biochemistry. Activation energy and transition state theory. Nomenclature and IUB classification of enzymes. Substrate specificity and active site architecture. Effect of physio-chemical factors on the rate of enzyme activity. Non-protein enzymes: Ribozymes.	15
2	**Enzyme Kinetics** Rate and order of enzymatic reactions. Michaelis-Menton equation, its assumptions and interpretation. Significance of Km and Vmax. Linear transformation of Michaelis-Menton equation- Line weaver Burk plot, Eddie Hofstee, Haynes- Wolf and Cornish-Bowden plot. Units of enzyme activity, specificity and specific activity and turnover number. Methods and strategies to design an enzymatic assay. Types of enzyme inhibition: (1) Competitive, (2) Uncompetitive and (3) Non-competitive.	20
3	**Mechanisms of Enzyme Catalysis** Mechanisms with examples of Acid-base catalysis, Covalent catalysis, Metal ion catalysis, Electrostatic catalysis, Proximity and orientation effects and Preferential binding of the transition state complex. Special cases of Lysozyme, Serine Proteases and Zymogens. Cooperativity and functions of Co-factors and Co-enzymes in enzyme activity. Regulation of enzyme activity and allosteric control.	20
4	**Applications of Enzymes** Application of enzyme in Washing, Textile, Food and Leather industries. Medical application of enzymes. Immobilized enzymes and their application	5
	Total Hours	**60**

References:

1. Stryer, L. (2015). Biochemistry. (8th ed.) New York: Freeman.
2. Lehninger, A. L. (2012). Principles of Biochemistry (6th ed.). New York, NY: Worth.
3. Voet, D., & Voet, J. G. (2016). Biochemistry (5th ed.). Hoboken, NJ: J. Wiley & Sons.
4. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2008).
5. Molecular Biology of the Cell (5th Ed.). New York: Garland Science.
6. Lodish, H. F. (2016). Molecular Cell Biology (8th Ed.). New York: W.H. Freeman.
7. Krebs, J. E., Lewin, B., Kilpatrick, S. T., & Goldstein, E. S. (2014). Lewin's Genes XI. Burlington, MA: Jones & Bartlett Learning.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the classroom in the form of attendance, assignments, verbal interactions etc.

c. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.