
# Course Outline Form

## ODD SEMESTER 2019

*Dear Student: Course outlines are intended to provide students with an overall plan for a course to enable them to function efficiently and effectively in the course.*

*Academic Programs*
*BSc Biochemistry*
*EMEA College*
*Kondotty*

# Course Outline : ENZYMOLOGY (2019-2020)

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| Name of the Stream | Science |
| Name of the Programme | BSc Biochemistry |
| Name of the Course | ENZYMOLOGY |
| Nature of the Course | Core Course |
| Semester | Third |
| Lecturer(s) | RAJESH.T.K |
| Name of the Coordinator | |
| Year | 2019-2020 |
| No of Credits | 3 |
| No of Contact Hours | 3 |
| Course Description | Enzymology is the study of enzymes, their kinetics, structure, and function, as well as their relation to each other. |
| Course Objectives | TO MAKE STUDENTS AWARE OF THE APPLICATIONS AND RECENT TRENDS IN ENZYMOLOGY<br>TO UNDERSTAND CLASSIFICATION AND BIOLOGICAL ACTIONS OF ENZYMES<br><br>TO MAKE STUDENTS AWARE OF THE APPLICATIONS AND RECENT TRENDS IN ENZYMOLOGY |
| Course Outcome | General awareness about enzymes and their reactions, gives a brief idea in clinical enzymology |
| Assessment Method | |
| Teaching Methods Used | |
| Textbook | |
| References | 1. Cook, P.F. and Cleland, W.W. Enzyme kinetics and Mechanism.Pub.Garland<br>Science London, New York : 2007<br>2. Dixon M. and. Webb E. C (1979) Enzymes: Longman Publication, London<br>3. Laidler, K.J. and Bunting, P.S , The Chemical Kinetics of Enzyme action Oxford<br>University Press London. |
| Internet Resources | |

## Internal Exam Pattern

| Items | Marks/20 | Marks/15 |
|---|---|---|
| Assignment | 4 | 3 |
| Test Paper(s)/Viva voce | 8 | 6 |
| Seminar/Presentation | 4 | 3 |
| Class Room Participation based on Attendance | 4 | 3 |

## External Exam Pattern

| Question Type | No of Question | Marks/Question | Total Marks |
|---|---|---|---|
| Short Questions(2-3 Sentences) | 15 | 2 | Ceiling 25 |
| Paragraph / Problem Type | 8 | 5 | Ceiling 35 |
| Essay Type | 2 out of 4 | 10 | 20 |
| **Total** | | | **80** |
| **Time** | | | **2.5 hrs** |

Graduate Attributes **Name of the Course:** ENZYMOLOGY

## Course Schedule

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| Introduction to enzymes: Historical development of enzymology as a discipline. Proteins as enzymes. (Briefly mention about ribozymes and abzymes). Definition, examples of holoenzyme, apoenzyme. | Week 1 |
| Coenzymes and cofactors:Definition: examples of a) metal ions b) coenzymes c) prosthetic group.. Coenzymes and their functions - NAD, NADP+,FAD, FMN, lipoic acid, TPP, pyridoxal phosphate and biotin.( structure and one reaction each) | Week 2 |
| Classification of enzymes, Need and rationale for classification of enzymes. IUPAC system of classification and nomenclature of enzymes: (Give one example each from each major class and its sub class). | Week 3 |
| Enzyme catalysis and Mechanism of enzyme action-: Idea of enzyme specificity; Concept of active site and the 'lock and key' model of Emil Fischer; Koshland's induced fit theory of enzyme catalysis. Standard free energy change in a reaction. | Week 4 |
| Transition state, energy of activation of non-enzymatic and enzymatic reaction; reaction rate, rate equation, rate constant; binding energy and release of binding energy; specificity of enzymes – absolute, group, linkage, and stereochemical specificity with example. | Week 5 |

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| Enzyme kinetics: Importance of kinetics; order of reactions; study of the factors affecting the<br>velocity of enzyme catalyzed reaction - enzyme concentration, temperature, pH, substrate | Week 6 |
| concentration, inhibitors and activators -Definition and significance of Vo, and VMAX value in | Week 7 |
| enzyme reaction. Derivation of Michaelis-Menten equation and Michaelis-Mention constant (KM). | Week 8 |
| Determination of KM by Lineweaver- Burk plot (for single-substrate enzyme catalyzed reaction). | Week 9 |
| Significance and relevance of KM value of an enzyme. Kcat (turnover number) and significance.Kcat/KM ratios for determining catalytic efficiency. | |
| Measurement of enzyme activity. Enzyme assays: In vitro measurements - fixed time and | Week 10 |
| continuous. Methods of measurement of enzyme activity.Quantitative expression of enzyme | Week 11 |
| activity; Units of activity; specific activity - definition and significance. International unit (IU) and | Week 12 |
| Enzyme inhibition: Reversible and irreversible – examples. Reversible- competitive, noncompetitive,<br>uncompetitive and mixed type inhibitions. Explanation of double reciprocal plot (1/v versus 1/s)in the presence of inhibitor. Antibiotic inhibitors of enzymes- penicillin, sulfa drugs,<br>methotrexate etc.Inhibitors as tools in biochemical studies | Week 13 |
| Enzyme regulation– Significance in metabolism. Types of regulations- reversible covalent<br>modification with examples of phosphorylation and adenylation (glycogen phosphorylase and | Week 14 |
| glutamine synthatase); allosteric regulation (aspartate trascarbamoylase); isoenzymes (lactate<br>dehydrogenase and creatine phosphokinase); zymogens (pepsin, trypsin). | Week 15 |
| Isolation, purification and characterization of enzyme:<br>General protocol: Solubilization, and extraction from sample; fractional precipitation (salting out,<br>pH, heat, organic solvents etc). Purification: by chromatography (exclusion, ion exchange,<br>adsorption, affinity); by electrophoresis (PAGE); isoelectric focusing. Criteria of purity: immunological, ultracentrifugation etc.<br>Unit X | Week 16 |
| Immobilization of enzymes:<br>Different methods of immobilization of enzymes (brief mention only). Industrial and clinical uses | Week 17 |
| of enzymes: detergent enzymes, as food additive, and in other industrial application (give examples:<br>thermo stable alpha amylase, papain, chymotrypsin etc.). Use of enzymes in ELISA. | Week 18 |

## Contact Details


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