

COURSE CONTENT

Course

Course code: BCH 312
Course title: Enzymology (3 Units)
Course status: Compulsory

Course Duration

3 hours per week

Lecturer Data

Name of the lecturers: Adeyemi, O.S.
Qualifications: *BSc, MSc, PhD, Biochemistry*
Department: Biological Sciences
College: Science & Engineering
E-mails: adeyemi.oluyomi@lmu.edu.ng
Office Location: Rm A306, First College Building
Consultation Hours: 2 – 3 pm (Wednesdays) and 10 – 12 pm (Fridays)

Name of the lecturers: Olaolu, T.
Qualification: *BSC, MSc, Biochemistry*
Department: Biological Sciences
College: Science & Engineering
E-mails:
Office Location:
Consultation Hours: 2 – 3 pm (Wednesdays) and 10 – 12 pm (Fridays)

Course Content:

Classification and nomenclature of enzymes. Mechanism of enzyme catalyzed reactions. Effects of temperature, pH, ions and inhibitors on enzymes. Active sites of enzymes. Estimation of kinetic parameters-enzyme activities, K_m , V_{max} , K_i , etc., Production, isolation, purification and characterization of enzymes. Vitamins and Coenzymes.

Course Description:

The course will expose students in the Biochemistry programme to the nature, properties and catalytic role performed by enzymes in biological processes. Description will be made of the general properties of enzymes, classification and nomenclature of enzymes and active site features of enzymes. In order to better understand the enzyme mechanism of action, the kinetics of enzyme catalysed reaction for single substrate and bi-substrate reactions will be described. Factors like temperature, pH ions or inhibitors which could affect the rate of enzyme catalysed reactions will also be described. Furthermore, the students will be introduced to the methods of isolation, purification and characterization of enzymes. Finally,

the role of vitamins and coenzymes in biochemical processes especially as enzyme cofactors will also be described.

Course Justification:

Enzymes are biological catalysts that mediate nearly all biochemical processes that comprise life. Knowledge of the nature, properties and mechanism of enzyme reactions as biological catalysts would aid the understanding of biochemical processes with significant relevance to medical, pharmaceutical, and biosciences.

Course Objective

At the end of the course, the students should be able to:

- (i) Describe enzymes and certain properties possessed by them that facilitate their actions.
- (ii) Identify the major classes of enzymes and the reaction catalyzed by each class.
- (iii) Explain the mechanism and kinetics of enzyme-catalyzed reaction for both single substrate and bi-substrate reactions.
- (iv) Describe the effects of temperature, pH, ions, and inhibitors on enzyme-catalyzed reaction.
- (v) Describe the method of isolation, purification and characterization of enzymes.
- (vi) Identify and explain biochemical roles of vitamin-derived coenzymes and other coenzymes.

Method of Grading:

S/N	Grading	Score (%)
1.	Test/Assignment	15
2.	Practical (laboratory work)	15
3.	Final Examination	70
	Total	100

Course Delivery Strategies:

Course delivery will be by Face-to-Face method, Participatory method and Lecture method. Assignments will be given out to students periodically either individually or in groups.

LECTURE CONTENT

Week 1: Introduction to enzymes

Objective: The students at the end of the lectures for the week should be able to;

- (i) Describe what enzymes are
- (ii) Highlight and explain the nature and properties of enzymes

Week 2: Classification and nomenclature of enzymes

Objective: The students at the end of the lectures for the week should be able to;

- (i) Mention the classes of enzymes
- (ii) Explain the function of each enzyme classification
- (iii) Explain enzyme nomenclature as per IUB recommendation

Week 3: Active sites of enzymes

Objective: The students at the end of the lectures for the week should be able to;

- (i) Describe the active site of enzyme
- (ii) Explain the chemistry of the active site
- (iii) Explain the models of active sites

Week 4: Mechanism of enzyme catalyzed reactions and the factors that affect enzymatic reactions

Objective: The students at the end of the lectures for the week should be able to;

- (i) Explain the difference in free energy profile for enzyme catalyzed reaction and non-enzyme catalyzed reaction
- (ii) Highlight and explain the general mechanisms of action for enzyme catalyzed reactions
- (iii) Mention and explain factors that affect enzyme catalyzed reactions, e.g. temperature, pH, cofactors, inhibitors etc
- (iv)

Week 5: Kinetics of enzyme catalyzed reactions

Objective: The students at the end of the lectures for the week should be able to;

- (i) Describe the approaches to the study of enzyme kinetics and the significance of kinetic parameters e.g. K_m , V_{max} , v_i etc
- (ii) Describe the various transformation of the Michaelis-Menten model
- (iii) Deduce the values for V_{max} , K_m and K_i from the various transformations of the Michaelis-Menten plots

Week 6: Mechanism of enzyme inhibition

Objective: The students at the end of the lectures for the week should be able to;

- (i) Describe enzyme inhibition
- (ii) Identify the various types of enzyme inhibition
- (iii) Distinguish the various inhibition types using the Double-Reciprocal plots
- (iv) Explain how the enzyme inhibition affect kinetic parameters

Week 7: Class Test

Week 8: Isolation of enzymes

Objective: The students at the end of the lectures for the week should be able to;

- (i) Describe the procedures for extraction and preparation of crude enzymes

Week 9: Methods of enzyme purification and characterization

Objective: The students at the end of the lectures for the week should be able to;

- (i) Describe the various methods of enzyme purification and characterizations e.g. precipitation, dialysis, electrophoretic, chromatographic etc

Week 10: Vitamins and coenzymes

Objective: The students at the end of the lectures for the week should be able to;

- (i) Describe the types of vitamins and their structures
- (ii) Describe the biochemical roles and deficiencies of each type of vitamin

Week 11: Co-enzymes

Objective: The students at the end of the lectures for the week should be able to;

- (i) Describe the classification of co-enzymes
- (ii) Describe the structure and biochemical roles of co-enzymes

Week 12 - 15: Practical Classes and Revision

Recommended Reading

1. Biochemistry, Third edition (2005) by Voet and Voet, Wiley, ISBN: 978-0-471-19350-0.
2. Harper's Illustrated Biochemistry, (2003) twenty-sixth edition. McGraw-Hill companies limited. ISBN-0-07-121766-5

3. Nelson, D. L. and Cox, M. M. (2004) *Lehninger Principles of Biochemistry*. 4th edition. Worth Publishers, New York.
4. Metzler, D. E. (2001) The specificity of enzyme action. *Biochemistry. The Chemical Reactions of Living Cells*. 2nd edition. Pg 455-469.
5. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003). *Enzymes: Mechanism of Action*. Harper's Illustrated Biochemistry. 26th edition. Pg 49-51
6. Nelson, D. L. and Cox, M. M. (2004) *Enzymes. Lehninger Principles of Biochemistry*. 4th edition. Pg 193-201
7. Purich, D. L. (1996) *Contemporary Enzyme Kinetics and Mechanisms*. New York: Academic Press.
8. Nomenclature Committee of the International Union of Biochemistry (1979) *Enzyme Nomenclature, Recommendations 1978*, Academic Press, New York.