UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
BIOL-322	Biochemistry II	8
Prerequisites	**Department**	**Semester**
BIOL-321	Life and Health Sciences	Spring
Type of Course	**Field**	**Language of Instruction**
Required	Biochemistry	English
Level of Course	**Lecturer(s)**	**Year of Study**
1st Cycle	Dr. Christos Papaneophytou	3rd
Mode of Delivery	**Work Placement**	**Corequisites**
Face-to-face	N/A	None

Course Objectives:

The main objectives of the course are to:

- Provide students with a comprehensive understanding of oxidative phosphorylation and the energy requirements for cell growth and maintenance.
- Make students aware of the metabolic pathways involving the four major metabolic compounds (carbohydrates, lipids, amino acids and nucleotides).
- Discuss the mechanisms by which these pathways are integrated and regulated and emphasize the relationship of bioenergetics to the physiological state.
- Relate the disruption of metabolic functions to disease states using specific examples.
- Enable students to develop basic laboratory skills to study biochemical molecules.

Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Describe how cells obtain energy from glucose oxidation both aerobically and anaerobically.
2. Contrast anabolic and catabolic pathways, outlining their key enzymatic steps.
3. Demonstrate how plants and other photosynthetic organisms convert light energy into chemical energy.
4. illustrate the role of the pentose phosphate pathway in producing NADPH and pentose sugars.
5. Map out the pathways for the synthesis and breakdown of glycogen and discuss their coordinated regulation in animal cells.
6. Explain the fundamental pathways for fatty acid breakdown and biosynthesis, including

their regulatory mechanisms.
7. Diagram the pathways of protein degradation and amino acid catabolism, including the urea cycle.
8. Explain nitrogen fixation and its significance in amino acids biosynthesis.
9. Illustrate the primary pathways of nucleotide biosynthesis.
10. Diagram the pathways of steroid biosynthesis.
11. Utilize Bioinformatics tools to predict enzymatic pathways and interactions.
12. Employ AI techniques to analyze complex datasets derived from biochemical experiments, enhancing understanding and accuracy in interpreting results.
13. Acquire laboratory skills in protein isolation, electrophoresis, Western blot analysis, and enzyme kinetics.

Course Content:

Lectures:
1. Introduction to metabolism
2. Glycolysis and Gluconeogenesis
3. The Citric Acid Cycle
4. Oxidative Phosphorylation
5. The Light Reactions of Photosynthesis
6. The Calvin Cycle and the Pentose Phosphate Pathway
7. Glycogen Metabolism
8. Fatty Acid Metabolism
9. Protein Turnover and Amino Acid Catabolism
10. Biosynthesis of Amino Acids
11. Biosynthesis of Nucleotides
12. Biosynthesis of Membrane Lipids and Steroids

Laboratory Sessions:
1. Dilutions, Concentrations, Acids, Bases and Buffers
2. Spectrophotometry: Beer's Law, Standard Curves and Protein Concentration
3. Enzyme Purification: Homogenization, centrifugation, ammonium sulfate precipitation, assay for lactate dehydrogenase (LDH) enzyme activity
4. Enzyme Kinetics of LDH: Michaelis-Menten graph, Km and Vmax calculations
5. Native Gel Separation of LDH isozymes
6. SDS-PAGE of LDH
7. Western Blot of LDH

Learning Activities and Teaching Methods:

Lectures (4h/week); Laboratory Sessions (3h/week); Review of literature papers, Cooperative learning.

Assessment Methods:

Assignment; Midterm Examination (1); Lab Report; Final Examination (1)

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Biochemistry, 10th ed.	J.M. Berg, G.J. Gatto Jr., J.K.Hines J.L. Tymoczko, L. Stryer	W.H. Freeman & Co.	2023	ISBN-13: 9781319486785 ISBN-10: 1319486789
Lehninger Principles of Biochemistry, 8th ed.	D.L. Nelson, M. Cox	W.H. Freeman & Co.	2021	9781319417420
Experiments on Biochemistry, 2nd ed.	S.O. Farrell, L.E. Taylor	Thomson Brooks/Cole	2006	ISBN-13: 978-0-495-01317-4

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Principles of biochemistry. 5th ed.	D.J. Voet, J.G. Voet, C.W. Pratt	Wiley	2018	ISBN-13: 9781119455103 ISBN-10: 1119455103