



## University of Nicosia, Cyprus

<b>Course Code</b> BIOL-422	<b>Course Title</b> Basic Concepts of Physical Biochemistry	<b>ECTS Credits</b> 8
<b>Department</b> Life and Health Sciences	<b>Semester</b> Spring/Fall	<b>Prerequisites</b> BIOL-321, -322 Biochemistry I, II
<b>Type of Course</b> Life Sciences Elective	<b>Field</b> Biology, Biochemistry	<b>Language of Instruction</b> English
<b>Level of Course</b> 1 <sup>st</sup> Cycle	<b>Year of Study</b> 3 <sup>rd</sup> or 4 <sup>th</sup>	<b>Lecturer</b> Dr. Demoliou Catherine
<b>Mode of Delivery</b> Face-to-face	<b>Work Placement</b> N/A	<b>Co-requisites</b> None

### Objectives of the Course:

The course aims to provide an understanding of the physical principles which underlie the biochemical properties of biological molecules. The main objectives of the course are to:

- Introduce concepts from physical chemistry to explain biochemically relevant phenomena.
- Describe the application of physical and chemical methods and concepts to understand the relationships between molecular sequence, molecular structure and molecular function
- Present an overview and examples of techniques and experimental approaches used to investigate molecular structure and function.

### Learning Outcomes:

After completion of the course students are expected to be able to:

1. Identify the physical chemistry laws which govern the biochemical properties of biological macromolecules.
2. Associate structure-function relationships of biological molecules with physical and chemical forces in solution.
3. Associate the techniques used for purification and analysis of molecular structure with the physicochemical properties of biological molecules.
4. Discuss how thermodynamics and kinetics are used to understand molecular structure, function and interactions and calculate relevant parameters.
5. Identify and explain the techniques used to investigate molecular interactions and to determine the 3D structure of macromolecules.
6. Appraise the use of analytical instruments in solving problems in biology and medicine.

**Course Contents:**

<ol style="list-style-type: none"> <li>1. Biological Macromolecules; intermolecular forces and interactions.</li> <li>2. Thermodynamic Principles.</li> <li>3. Molecular Thermodynamics.</li> <li>4. Enzyme kinetics; equilibrium systems.</li> <li>5. Methods for the Separation and Characterization of Macromolecules.</li> <li>6. Solutions and Macromolecules; density, ultracentrifugation.</li> <li>7. Crystallography and X-Ray Diffraction.</li> <li>8. Quantum Mechanics; Light Spectroscopy; fluorescence.</li> <li>9. Absorption Spectroscopy, Linear and Circular Dichroism.</li> <li>10. Emission Spectroscopy.</li> <li>11. Nuclear Magnetic Resonance Spectroscopy.</li> <li>12. Macromolecules in Solution: Thermodynamics and Equilibria.</li> <li>13. Thermodynamics of Transport Processes.</li> </ol>
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**Learning Activities and Teaching Methods:**

Lectures, discussions on relevant literature and examples of data output, cooperative learning, use of computer databases (PDB) and molecular modelling programs to build and analyze proteins, DNA and drugs.
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**Assessment Methods:**

Assignments, Tests and Mid-term Exam; Final Exam
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**Required Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
1. I. Tinoco, K. Sauer, et.al.	Physical Chemistry: Principles and Applications in Biological Sciences	Prentice Hall Wiley	2001, 4 <sup>th</sup> ed.	ISBN: 0130179604
2. N.C. Price et.al	Principles and problems in physical chemistry for biochemists	Oxford University Press	2001, 3rd ed.	ISBN: 0198792816

**Recommended Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
1. Nelson D.Leninger	Lehninger principles of biochemistry	Worth Publishers	3 <sup>rd</sup> ed. 2000	ISBN- 1572599316
2. Sheehan, David,	Physical Biochemistry: Principles and Applications	John Wiley & Sons	2 <sup>nd</sup> ed, 2009	<b>ISBN-10:</b> 0470856025 <b>ISBN-13:</b> 978- 0470856024

