



Course Title: Biophysics
Course Code: GCMB 214
Credit Units: 02

L	CT	A	Lab	TOTAL CREDIT UNITS
2			0	2

Course Objectives:

The course aims to provide students with a foundation in the basic concepts of Biophysics. Topics will include canonical and non-canonical structures of nucleic acids, structure of proteins, enzymes etc. Basic ideas of diffusion, thermodynamics and kinetics will be discussed in the context of biological processes. Fundamental concepts that underlie biomolecular interactions will be discussed and biophysical methods that are employed for the structural analysis of these systems will be introduced at an elementary level.

Pre-requisites: Fundamental Physics & Chemistry
Biochemistry

Student Learning Outcomes:

At the end of the course the student will be able to:

- Demonstrate knowledge of the fundamental concepts in physics and chemistry that underlie biological processes.
- Define the structural characteristics of nucleic acids and proteins and examine parameters that variously determine their stability and function(s).
- Describe the principles that govern biomolecular interactions and appreciate how established methods of research and enquiry are employed to analyze the different aspects of these interactions.

Course Contents/Syllabus:

	Weightage (%)
Module I	30
Basic Biophysical principles Introduction to fundamental physical and chemical principles that govern biological systems, Molecular forces in biological structures, covalent and non-covalent interactions, Laws of thermodynamics, concept of thermodynamic parameters (Gibbs free energy, enthalpy and entropy) Diffusion and Brownian motion, diffusive processes in biology ,Electrochemical potential, membrane potential, electrical properties of biological systems	
Module II	25

Structure of Nucleic acids Structure of double-Stranded DNA, different forms of DNA (A-DNA, B-DNA, Z-DNA) Helix parameters, parallel DNA, basic introduction to multi-stranded DNA structures (triplex and quadruplex) Effect of cations, pH, temperature and chemical agents on the structure and stability of DNA	
Module III	25
Protein structure and function Primary structure of proteins, secondary, tertiary and quaternary structure of proteins, Ramachandran plot Effect of pH, temperature and chemical agents on the structure and stability of proteins, Denaturation and renaturation of proteins	
Module IV	20
Biomolecular Interactions and their characterization Introduction to fundamental concepts underlying DNA-drug interactions, DNA-protein interactions, and protein-protein interactions, Elementary introduction to biophysical methods such as UV-VIS spectroscopy, X-ray crystallography, Fluorescence spectroscopy etc.	

Pedagogy for Course Delivery:

Lectures: 27

Class Test: 2

Home Assignment: 1

Total: 30

Assessment (L&T)/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
100	--	70

Theory Assessment (L):

Continuous Assessment/Internal Assessment						End Term Examination
Components (Drop down)	Class Test 1	Class Test 2	Home Assignment	Presentation/ Seminar	Attendance	
Weightage (%)	10	10	5	0	5	70

Text Books:

- Biochemistry by Lehninger.
- DNA Structure and Function by Richard R. Sinden. (Copyright 1994 edition by Academic Press)
- Protein Structure and function by Carl Braden & John Tooze. (Copyright 1991, 1999 by Garland Publishing).

References:

- *Basic Biophysics for Biology* by E.K. Yeager.

Any other Study Material:

- Research Articles