



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
SECOND SEMESTER 2020-2021
Course Handout (Part II)

Date: 15/01/2021

In addition to part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No. : **BIO F215**
Course Title : **BIOPHYSICS**
Instructor-In-Charge : **SHIBASISH CHOWDHURY**
: Navin Singh

1. SCOPES AND OBJECTIVE:

The objective of the course is to introduce the students to the concepts of physical principles in the biological and biomimetic molecular systems. Properties and conformations of biomolecules like amino acids, proteins, nucleotides, nucleic acids as well as biomimetic systems like monolayers and bilayers are to be discussed. Related physical phenomena in these systems like structural transitions, protein folding, membrane equilibria are to be discussed. Emphasis will also be given to understand the principles of major experimental techniques applied to understand these physical problems.

2. Text Book (TB) :

1. *Biophysical Chemistry*, Part I, Part II and Part III", Charles R Cantor and Paul R. Schimmel, W.H. Freeman and Co., New York.
2. *Biological Physics: Energy, Information, Life*, Philip Nelson, Chiral Science, 2020

3. Reference Book:

Principal of Physical Biochemistry" Kensal E. van Holde, W. C. Johnson and P.S. Ho John,
2nd Edi. Pearson Prentice Hall

4. Course Plan

Lec. No.	Learning Objectives	Learning Outcomes	Ref
	Self study	Basics of thermodynamics, bondings, interactions, basics of biomolecules, Biochemistry	Chapter-2 of TB-2, Text book of Physical Chemistry
1	Overall idea of the course	Overview of subjects	Chapter-1 of TB
2-3	Biological Macromolecules	Macromolecules, configuration and conformation, symmetry	Chapter-1 of RF
4-7		Protein structure: Primary, Secondary, Tertiary and Quaternary structure of proteins	Chapter-2 of TB-1, Chapter-1 of RF
8-9	Interactions between the molecules	Weak interactions: Intermolecular interaction, H-bonding, hydrophobic interaction, Electrostatic interaction	Chapter-1 of TB, Chapter-1 and 3 of RF
10-13	Biological Macromolecules	The Structure of Nucleic acids	Chapter-3 of TB, Chapter-1 of RF-2, Chapter-3 of RF





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14	Biological Macromolecules	Other Biological polymers	Chapter-2 of TB, Chapter-4 of RF-1
15-16	Molecular Mechanics in Macromolecule	Molecular mechanics, stabilizing interactions in Macromolecules	Chapter-3 of RF-2
17-18	Simulating macromolecule structures	Energy minimization, Molecular dynamics	Chapter-3 of RF-2
19	Thermodynamics of Living Systems	The probabilistic facts of life	TB2-3.1
20		The Boltzmann distribution	TB2-3.2
21		Random walk & diffusion	TB2-4.1
22		Entropy & disorder	TB2-6.1-6.2
23		The II law	TB2-6.3-6.4
24		Microscopies & Macroscopic world	TB2-6.6
25-26	Single Molecule Techniques	Optical & Magnetic Tweezers	Class Notes
27		Atomic Force Microscope	Class Notes
28-30	Cooperative Transitions in Biopolymers	Elasticity Models of polymers	TB2-9.1
31-32		Stretching single molecule	TB2-9.2
33		Cooperativity	TB2-9.4
34-36		The helix coil transition	TB2-9.5
37-41	Spectroscopic techniques	Introduction to Absorption spectroscopy	Chapter-9 of RF
		Introduction to Circular Dichroism (CD)	Chapter-10 of RF
		Introduction to Fluorescent Spectroscopy	Chapter-11 of RF

5. Evaluation Scheme:

Component	Duration	Weightage%	Date & Time	Remarks
Mid-Semester Test	90 Mins	30%	<TEST_1>	OB
Surprise Quizzes, assignments and Seminar	Throughout the semester distributed in class as well as in tutorial hour	30%		OB
Comprehensive Exam.	120 Min.	40%	07/05/2021	OB

6. Chamber Consultation Hours: To be announced.

7. Notices: Notices, if any, concerning the course will be displayed on the Notice Board of Biological Sciences notice board.

8. Make up Policy: Make up will be given on genuine grounds as determined by the Instructor-in-charge.

Instructor In Charge
(BIO F215)

