

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, Hyderabad Campus**  
**SECOND SEMESTER 2021-2022**  
**Course Handout (Part II)**

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Date: 15/01/2022

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 : **DEBASHREE BANDYOPADHYAY**

**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 equilibrium 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):** "Introduction to Molecular Biophysics", J. A. Tuszynski and M. Kurzynski, Published by CRC Press (Indian Edition), Chennai

**3. Reference Book (RF) :** 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. "Principles of Physical Biochemistry" Kensal E. van Holde, W. C. Johnson and P.S. Ho John, 2<sup>nd</sup> Edi. Pearson Prentice Hall

**4. Course Plan**

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
	Self study	Basics of thermodynamics, bondings, interactions, basics of biomolecules, Biochemistry	Chapter-2 of RF-2, Physical Chemistry Text Book
1	Overall idea of the course	Overview of subjects	Chapter-1 of TB
2	Biological Macromolecules	Macromolecules, configuration and conformation, symmetry	Chapter-1 of RF-2
3-4		Weak interactions: Intermolecular interaction, H-	Chapter-2 of TB, Chapter-1 of RF-2

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		bonding, hydrophobic interaction	
5-8	Biological Macromolecules	Protein structure: Primary, Secondary, Tertiary and Quaternary structure of proteins	Chapter-2 of TB, Chapter-1 of RF-2, Chapter-2 of RF-1
9-11	Biological Macromolecules	The Structure of nucleic acids	Chapter-2 of TB, Chapter-1 of RF-2, Chapter-3 of RF-1
12-13	Biological Macromolecules	Lipids and Membrane equilibria	Chapter-2 of TB, Chapter-25 of RF-1
14-17	Molecular Thermodynamics	Molecular mechanics, stabilizing interactions in Macromolecules	Chapter-3 of RF-2
18-19	Simulating macromolecule structures	Energy minimization, Molecular dynamics	Chapter-3 of RF-2
20-22	Physics of macromolecules	Conformation dependent properties of polymeric systems	Chapter-3 of TB, Chapter-4 of RF-2
23-24	Helix coil transitions in biomolecules	Proteins	Chapter-3 of TB, Chapter-4 of RF-2, Chapter-20 of RF-1
25-26	Thermodynamics of macromolecules	Protein folding	Chapter-3 of TB, Chapter-4 of RF-2, Chapter-21 of RF-1
27-28		Nucleic acids (DNA, RNA)	Chapter-4 of RF 2
29-30	Crystallographic techniques to determine the molecular structures	X-ray crystallography	Chapter 13 and 9 of RF-1 (Part-II), Chapter-6 of RF-2
31-32	Magnetic Resonance method	Basic principles of NMR	Chapter-12 of RF-2
33	Spectroscopic techniques	Absorption spectroscopy	Chapter-9 of RF-2
34-35	Single Molecule Techniques	Circular Dichroism (CD)	Chapter-10 of RF-2
36-38		Fluorescent Spectroscopy	Chapter-11 of RF-2
39-40		Atomic force microscopy	Chapter-16 of RF-2

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**5. Evaluation Scheme:**

<b>Component</b>	<b>Duration</b>	<b>Weightage (%)</b>	<b>Date &amp; Time</b>	<b>Nature of Component</b>
Midsem	90 mins	30%	11/03 9.00am to 10.30am	CB
Seminar / assignment / quizzes	Throughout the semester distributed in class as well as in tutorial hour	30%	to be announced in the class	15% CB + 15% OB
Compre. Exam.	120 mins	40%	09/05 FN	25%CB + 15%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 or on BITS CMS.

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

**9. Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Instructor In Charge**

**BIO F215**