

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI,**  
**Hyderabad Campus SECOND**  
**SEMESTER 2024-2025**  
**Course Handout (Part II)**

---

Date: 06/01/2025

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 : **Kirtimaan Syal**  
**Instructors: Kirtimaan Syal, Sudipta Maiti**

**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. "Principal 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**

Lect. No.	Learning Objectives	Topics to be covered	Ref
	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-bonding, hydrophobic interaction	Chapter-2 of TB, Chapter-1 of RF-2
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

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI,**  
**Hyderabad Campus SECOND**  
**SEMESTER 2024-2025**  
**Course Handout (Part II)**

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
14-15	Physics of macromolecules	Conformation dependent properties of polymeric systems	Chapter-3 of TB, Chapter-4 of RF-2
16-18	Helix coil transitions in biomolecules	In proteins and nucleic acids (DNA, RNA)	Chapter-4 of RF 2
19-20	Molecular Thermodynamics	Protein folding	Chapter-3 of TB, Chapter-4 of RF-2, Chapter-21 of RF-1
21-25	Simulating macromolecule structures	Energy minimization, Molecular dynamics	Chapter-3 of RF-2
26-28	Crystallographic techniques to determine the molecular structures	X-ray crystallography	Chapter 13 and 9 of RF-1 (Part-II), Chapter-6 of RF-2
29-32	Magnetic Resonance method	Basic principle 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

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI,**  
**Hyderabad Campus SECOND**  
**SEMESTER 2024-2025**  
**Course Handout (Part II)**

---

**5. Evaluation Scheme:**

Component	Duration	Weightage%	Date & Time	Nature
Midsem	90 Mins	30%	08/03 9.30 - 11.00AM	CB
Lecture & tutorial participation	Diverse	15%	Continuous Evaluation	OB
Assignments/ Group Discussion/ Presentations	Diverse	20%	Continuous Evaluation	OB
Compre. Exam.	3 hrs.	35%	14/05FN	CB

\*OB: Open book; CB: Closed book

**6. Minimum pass-mark criteria for getting a valid grade:**

A student should obtain 30% of the average of the top few performers in the class, or 40% of the median marks of the class, whichever is lower to clear the course. Student failing to do so will be reported as NC (Not cleared).

**7. Chamber Consultation Hours:** To be announced in the class.

**8. Notices:** Notices, if any, concerning the course will be displayed on BITS CMS.

**9. Make up Policy:** Make up will be given on genuine medical grounds as determined by the Instructor-in-charge. If the absence is anticipated, before the examination, prior permission of the instructor-in-charge is necessary. Request for make-up should reach the instructor-in-charge at the earliest. Make-up for class tests/ quizzes and assignments are not given.

**10. 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**