**SECOND SEMESTER 2020-2021**

**COURSE HANDOUT (PART-II)**

16/01/2021

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 : **RAMAKRISHNA VADREVU (L)**

# : I Shivakumar (T)

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.

1. **Text Book (TB)**: "Introduction to Molecular Biophysics”, J. A. Tuszynski and M. Kurzynski, Published by CRC Press (Indian Edition), Chennai
2. **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.

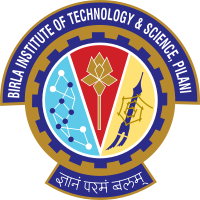
2. “Principal of Physical Biochemistry” Kensal E. van Holde, W. C. Johnson and P.S. Ho John, 2nd Edi. Pearson Prentice Hall.

Reference Book 1 (Parts I,II,III) serves as a general reference for all the topics.

# Course Plan

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| **Lec.**  **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 |

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, Hyderabad Campus**



**INSTRUCTION DIVISION SECOND SEMESTER 2016-2017**

**Course Handout (Part II)**



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| 2 | Biological Macromolecules: Stabilizing forces | 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 |
| 5-7\* | Biological Macromolecules: Structure and Conformation | Protein structure: Primary, Secondary, Tertiary and  Quaternary structure of proteins | Chapter-2 of TB, Chapter-1 of RF-2,  Chapter-2 of RF-1 |
| 8-10 | Biological Macromolecules | The Structure of nucleic acids | Chapter-2 of TB, Chapter-1 of RF-2,  Chapter-3 of RF-1 |
| 11-12 | Biological Macromolecules | Lipids and Membrane equilibria | Chapter-2 of TB, Chapter-25 of RF-  1 |
| 13-16 | Molecular Thermodynamics | 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 |
| 19-23 | Physics of macromolecules | Conformation dependent  properties of polymeric systems | Chapter-3 of TB,  Chapter-4 of RF-2 |
| 24-25 | Helix coil transitions in biomolecules | In proteins | Chapter-3 of TB, Chapter-4 of RF-2, Chapter-20 of RF-  1 |
| 26-27 | Helix coil transitions in biomolecules | Protein folding | Chapter-3 of TB, Chapter-4 of RF-2,  Chapter-21 of RF- 1 |
| 28-29 | In nucleic acids (DNA, RNA) | Chapter-4 of RF 2 |
| 30-31 | Crystallographic techniques to determine the molecular structures | X-ray crystallography | Chapter 13 and 9  of RF-1 (Part-II), Chapter-6 of RF-2 |
| 32-34 | Nuclear Magnetic Resonance  method | Basic principle of NMR | Chapter-12 of RF-  2 |
| 35-36 | Spectroscopic techniques | Absorption spectroscopy | Chapter-9 of RF-2 |
| 37-38 | Single Molecule Techniques | Circular Dichroism (CD) | Chapter-10 of RF-  2 |
| 39-40 | Fluorescent Spectroscopy | Chapter-11 of RF-  2 |
| 41-42 | Atomic force microscopy | Chapter-16 of RF-  2 |

* + Some basic topics such as the fundamental aspects of protein structure covered in the previous course(s) are for Self study

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# Evaluation Scheme:

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| **Component** | **Duration** | **Weightage %** | **Date & Time** | **Remarks** |
| Midsem | 90 min | 30 | 06/03 11.00 - 12.30PM | OB |
| Assignment/Qui | Throughout the | 30 |  | OB |
| zes | semester distributed |  |  |
| (Announced/Sur | in class as well as in |  |  |
| prise/inclass/tak | tutorial hour |  |  |
| ehome |  |  |  |
| Compre. Exam. | 120 min | 40 | 17/05 AN | OB |

1. **Chamber Consultation Hours:** To be announced.
2. **Notices:** Notices, if any, concerning the course will be displayed on the Notice Board of Biological Sciences notice board and or on CMS.
3. **Make up Policy:** Make up will be given on genuine grounds (such as hospitalization) as determined by the Instructor-in-charge only for Midsem & Comprehensive exam. The decision of the IC will be final.
4. **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