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.

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, 2nd Edi. Pearson Prentice Hall.

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

4. Course Plan

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

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

5. Evaluation Scheme:

Component	Duration	Weightage %	Date & Time	Remarks
Midsem	90 min	30	06/03 11.00 - 12.30PM	OB
Assignment/Quizes (Announced/Surprise/inclass/takehome	Throughout the semester distributed in class as well as in tutorial hour	30		OB
Compre. Exam.	120 min	40	17/05 AN	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 and or on CMS.

8. 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.

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