SEMESTER S5

BIOPHYSICS

Course Code	**PEBBT523**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	Understanding of Thermodynamics and Cell biology	**Course Type**	Theory

Course Objectives:

1. This course aims to prepare the students to understand the Molecular Structure & Interactions of Biological Systems and Energetics and Dynamics of Biological Systems and physical principles of living systems.

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Molecular Structure & Interactions of Biological Systems:** Molecular and Ionic intermolecular interactions as the basis for biological structure formation: Hydration radii, Debye-Huckel Radii, Intermolecular interactions	9
2	**Biomolecular interfaces Interfacial phenomena and Membranes:** Surface tension, Phase boundaries, Adsorption Isotherms, Self-assembly, van der Waals theory, Electrical Double layers, DLVO theory;	9
3	**Energetics and Dynamics of Biological Systems:** Fundamentals of Thermodynamics & Equilibrium: Free Energy, Entropy, Van't Hoff Equation; Diffusion dynamics and kinetics: Flux, Brownian Diffusion, Stokes-Einstein Equation; Mechanical Properties of Biological materials: viscosity, Visco-elastic properties; Crowded and Disordered dynamics;	9

4	**Physical principles in Living Systems:** Dynamics of Molecular Motors; Mitochondrial Fission & Fusion dynamics; Membrane Lipid Diffusion Dynamics; Protein Folding Kinetics	**9**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • A total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub-divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course, students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Apply the basic principles of physical interaction to biological systems	**K3**
CO2	Analyze the theories that formulate the biomolecular interfaces	**K4**
CO3	Apply the fundamentals of bioenergetics and diffusion dynamics to interpret the properties of biological materials	**K3**
CO4	Illustrate the physical functioning principles of membrane organelles and molecules in living systems.	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		2	2							**2**
CO2	3	2										2
CO3	3	2					2					2
CO4	3	2										2

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Biophysics: an introduction.	Glaser, R.	Springer Science & Business Media. 2012	2012
2	Physical biology of the cell.	Phillips, R., Kondev, J., Theriot, J., & Garcia, H.	Garland Science. 2012	2012
3	Biophysics: An Introduction.	Cotterill, R.	John Wiley & Sons. 2003	2003

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Biophysics: a physiological approach.	Dillon, P. F.	Cambridge University Press. 2012	2012
2	Fundamentals of Biophysics.	Rubin, A. B.	John Wiley & Sons. 2014	2014
3	Biological Thermodynamics.	Haynie, D. T.	Cambridge University Press. 2008	2008

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://onlinecourses.nptel.ac.in/noc21_ph13/preview
2	https://archive.nptel.ac.in/courses/104/102/104102009/
3	https://onlinecourses.nptel.ac.in/noc22_bt32/preview
4	https://archive.nptel.ac.in/courses/115/101/115101121/

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