AMITY UNIVERSITY
UTTAR PRADESH

Annexure 'CD – 01'

FORMAT FOR COURSE CURRICULUM

Course Title: Introduction to Biophysics
Course Code: GCMB103
Credit Units: 02

L	T	P/S	Lab	TOTAL CREDIT UNITS
2	-	-	-	2

Course Objectives:

Course Objectives:
The objective of the course is to provide students basic understanding about the theory and experimental techniques from physics to analyze and understand biological structures and functions.

Pre-requisites: Students should have good knowledge of undergraduate physics, especially statistical mechanics, and a corresponding adeptness with math.

Student Learning Outcomes:

- Understanding physical principles that underlie the dynamics of life
- Make aware about electrical properties of the cell and its usefulness
- Glimpse of applications of physical techniques used in biology and medicine
- Focuses on the thermodynamics of biological systems

Course Contents/Syllabus- Theory:

	Weightage (%)
Module 1: Atomic structure, physical units and bonding	**20**
Structure of atoms and molecules, Pauli's exclusion principle, units of cell shape and size, cell organelle and biomolecules, viscosity and its applications, physical properties of cytoplasm, Brownian motion and diffusion, overview of physics of biomolecules, ionization energy, electron affinity, physical properties of covalent bond and weak non-covalent interactions.	
Module 2: Electrical properties of cell	**20**
Cell surface charge, resting membrane potential, action potential and its properties, Permeability changes during action potential, ion channels, The Nernst equation, The Goldman equation, The Nernst-Planck equation, The Hodgkin-Katz experiments, role of K^+ and $Na^{+.}$	
Module 3: Biophysics of proteins, lipids, DNA and membrane	**20**
Concepts of thermodynamics, protein binding, protein and DNA folding, cooperative transitions (helix coil transitions and denaturation), Physical properties of biological membrane (elasticity and plasticity), physical properties of lipids the	

building blocks of membrane, elastic constants and its importance, thermodynamics of membranes, electrostatics, hydrophobic effect, elastic theory and lipid-protein interactions.	
Module 4: Techniques of physics in Biology	**20**
Spectroscopy (Ultraviolet and infrared): Principle, instrumentation and applications. Circular dichroism (CD) and optical rotatory dispersion (ORD): principles and applications. Fluoresces and phosphorescence and its applications. Atomic absorption spectroscopy: Principle and instrumentations. Hydrodynamics methods: centrifugation, ultracentrifugation and their applications.	
Module 5: Techniques of physics in Medicine	**20**
Principle, instrumentation and applications of X-Ray diffraction, isotope labelling, dynamic light scattering (DLS), quantum dot imaging, magnetic resonance Imaging (MRI), tomography and nuclear magnetic resonance (NMR) techniques, photodynamic therapy.	

Pedagogy for Course Delivery:
Lectures: 28
Home Assignment 1
Class Test: 2
Total: 30

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
100	**00**	**100**

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment						End Term Examination
Components (Drop down)	**Class Test 1**	**Class Test 2**	**Home Assignment**	**Presentation/ Seminar**	**Attendance**	
Weightage (%)	5	10	5	5	5	70

Text:

- Essentials of Biophysics, P Narayanan (2005), New Age International Publication, New Delhi.
- Handbook of Molecular Biophysics (Methods & Application), 2009, HG Bohr, Wiley
- Elementary Biophysics: An Introduction, by P. K. Srivastava Physics For the Biological Sciences, by Hallett et al.

References:

- Biophysical Chemistry, The Behaviour of biological macromolecules, Vol I,II, III, Cantor and Schimmel, (2008), W H Freeman and Co
- Molecular and Cellular Biophysics, Meyer B Jackson (2006), Cambridge)

Any other Study Material:

Research papers and review articles