Name of the Programme: M.Sc. Marine Biotechnology

Course Code: GBT-504

Title of the Course: BIOPHYSICAL PRINCIPLES & ANALYTICAL TECHNIQUES

Number of Credits: 2

Effective from AY: 2022-23

Pre-requisites for the Course:	No prerequisite is required	
Course Objectives:	The course is designed to 1) provide broad exposure to basic techniques used in Modern Biology research. 2) impart a basic conceptual understanding of the principles of these techniques and emphasize the biochemical utility of the same. 3) have a clear understanding of all analytical techniques such that the barrier to implementing the same is abated to a great extent.	
Content:	**MODULE I** • Description of Macromolecular Structure, Intermolecular and Intramolecular forces in protein, DNA and other biomolecules. • Diffusion, Brownian motion and sedimentation, determination of molecular weight from sedimentation and diffusion. • Concept and application of Chemical and Physical equilibria in biological system. • Nature and Role of Ionic, Covalent and Noncovalent Interaction in molecular confirmation, scaffolding and packaging of protein and DNA • Thermodynamics of protein folding: Protein folding kinetics, Misfolding and aggregation. • Physical biochemistry of cell: Chemical forces translation and rotation, diffusion, directed movements, biomolecules as machines, work, power and energy, thermal, chemical and mechanical switching of biomolecules, • Biochemical and biophysical characterizations of	**No. of hours** 15

	biomolecules: Fluorescence from GFP), UV-VIS absorption and emission spectra resulting from intrinsic Tryptophan and GFP chromophores, Fluorescence quenching and polarization studies, Unfolding and refolding studies using CD. protein 15 hours 11 diffusion, dynamics by fluorescence correlation spectroscopy.	15
	MODULE II • Spectroscopy: Electromagnetic radiations in spectroscopic techniques. Beer-Lambert law, UV/Visible spectroscopy, Fluorescence spectroscopy, Emission, excitation, Quenching, Quantum Yield. Nuclear magnetic resonance Spectroscopy. Electron spin resonance spectroscopy. • Centrifuge: Basic concepts of centrifugation. Calculation of g value from RPM. Types of rotors used, Differential centrifugation, Density gradient centrifugation. Rate-zonal centrifugation, Isopycnic centrifugation. • Microscopy: Abbey's law, Resolution, Magnification, Phase-contrast microscopy, Confocal microscopy, High resolution microscopy, • Nanoscopy: Atomic force Microscopy, Scanning tunneling Microscopy, Scanning electron microscopy, Transmission electron microscopy and Cryo-electron microscopy X-ray diffraction.	
Pedagogy:	Lectures/ tutorials/assignments.	
References/ Readings:	1. C.R. Cantor and P.R. Schimmel, Biophysical Chemistry (Part1-3), 2nd Edn., 1982. 2. M.A. Subramaniam, Biophysics: Principle and techniques. MJP Publishers, 2021. 3. K. Salman, and Z. Diaz, Principal and Techniques of Bioinstrumentation. Intelliz Publisher, 2016. 4. J. Frank, Three Dimensional Electron Microscopy of Macromolecular Assemblies. Academic Press., 2006. 5. I. Tinoco, K. Sauer, J. Wang, and J. Puglisi, Physical Chemistry: Principles and Applications in the Biological Sciences. Prentice Hall, Inc. 2013 6. P. Atkins, Physical Chemistry for the Life Sciences (2nd Revised Edition), 2015.	

	7. A. Cooper, Biophysical Chemistry. Royal Society of Chemistry, 2011. 8. K. E. Van-Holde, C. Johnson, Principles of Physical Biochemistry, 3rd ed. Prentice Hall, 2010.
Course Outcomes:	1. Students will learn to combine previously acquired knowledge of physics and chemistry to understand the biochemical processes in the cell. 2. This course will offer them broad idea of instruments/techniques used in biological science laboratories. 3. Student will achieve knowledge that will be helpful to use and handle research lab instruments. 4. After completion of this course student will have a clear idea of the industrial applications of bioinstrumentations that will be advantageous for them to find a job /research scope in Industries and academics.

(Back to top)