Bio Physics

Course Outcomes

- Basic fundamentals of living organism and its interactions in domains of Physics in
- Biology
- Understating of heat transfer in biomaterials and its mechanism
- Diversifying of thermal, statistical physics in biological domain.
- Understating fluid mechanisms in living organism in the domain of Physics

UNIT I

- Building Blocks & Structure of Living State: Atoms and ions, molecules essential forlife, what is life.
- Living state interactions: Forces and molecular bonds, electric &thermal interactions, electric
- Dipoles, casimir interactions, domains of physics in biology. (18Lectures)

UNIT II

- Heat Transfer in biomaterials: Heat Transfer Mechanism, The Heat equation, Joule heating of tissue.
- Living State Thermodynamics: Thermodynamic equilibrium, first law of thermodynamics andconservation of energy. Entropy and second law of thermodynamics, Physics of many particle systems, Two state systems, continuous energy distribution, Composite systems, Casimircontribution of free energy, Protein folding and unfolding. (19 Lectures)

UNIT III

Open systems and chemical thermodynamics: Enthalpy, Gibbs free energy and chemical potential, activationenergy and rate constants, enzymatic reactions, ATP hydrolysis & synthesis, Entropy of mixing, the grandcanonical ensemble, Hemoglobin. Diffusion and transport Maxwell-Boltzmann statistics, Fick's law of diffusion, sedimentation of Cell Cultures, diffusion in a centrifuge, diffusion in an electric field,Lateral diffusion in membranes, Navier stokes equation, low Reynold's Number Transport, Active and

passive membrane transport. (19 Lectures)

UNIT IV

Fluids: Laminar and turbulent fluid flow, Bernoulli's equation equation of continuity, venture effect, Fluid dynamics of circulatory systems, capillary action. Bioenergetics and Molecular motors: Kinesins, Dyneins, and microtubule dynamics, Brownian motion, ATP synthesis in Mitochondria, Photosynthesis in Chloroplasts, Light absorption in biomolecules, vibrational spectra of bio-biomolecules. (19 Lectures)

Reference Books:

1. Introductory Biophysics, J. Clay comb, JQP Tran, Jones & Bartelett Publishers

2. Aspects of Biophysics, Hughe S W, John Willy and Sons.

3. Essentials of Biophysics by P Narayanan, New Age International Introduction to Spectroscopy