

MB1PG02 - BIOPHYSICS, BIOINSTRUMENTATION AND BIOINFORMATICS

Number of Hours / Week: 4

Credits: 4

UNIT I

Laws of thermodynamics, the concept of enthalpy, entropy and free energy, thermodynamic equilibrium, redox potential, high energy molecules, examples of redox potential in biological system. DNA polymorphism, GC content and denaturation kinetics, Cot curve, DNA-Protein interaction-. Lambda repressor and cro binding to DNA. Interactions of transcription factors- HLH, bHLH, Leucine Zipper, Cys-His, Zinc fingers. Histone-DNA interaction, RNA protein interactions DNA-drug Interaction.

UNIT II

Structural implication of peptide bond, Ramachandran plot, protein families, alpha domains, beta domains, alpha- beta domains, Protein-drug interaction peptide mass finger printing using MALDI-TOF, MASCOT database. Energy minimization in molecular docking

UNIT III

Microscopy: Light, Scanning and Transmission electron, phase contrast, polarization, confocal and interference microscopy, CCD camera, Introduction to Atomic force microscopy. Spectroscopy: Beer-Lamberts law, Principle, Instrument Design, methods and Applications of UV-Visible spectra, IR spectra, Raman Spectra, Fluorescence spectra, NMR and ESR spectra

UNIT IV

Principle, Instrument Design, methods and Applications of Chromatography, ion exchange, molecular sieve, affinity chromatography, TLC, GC, HPLC, Centrifugation and Ultra centrifugation, PAGE, SDS PAGE, Capillary Electrophoresis, isoelectric focusing, Potentiometry, pH meter, ion selective electrodes. Principle, Instrument Design, methods and Applications of Polarimetry, ORD, CD, Light scattering , Refractometry, Flow cytometry, Cytometry, X-ray diffraction by crystals, , Electron diffraction, Application in Biology, autoradiography, GM counter, Liquid scintillation counting, biosensor, dialysis, ultrafiltration

UNIT V

Introduction to Bioinformatics, Internet, - data mining Online databases and search tools, data organization, Biological data bases, structural data bases, derived and specialized data bases , DNA and RNA sequence data bases, genomic sequences, protein sequence data bases, Distance matrix methods and parsimony. Multiple sequence alignments-tree alignments, star alignments, pattern in pair wise alignment, genetic algorithm. Sequence analysis softwares, SS search, BLAST, FASTA, CLUSTAL, Phylogenetic analysis, construction of phylogenetic tree, evolutionary changes in nucleotide and protein sequences, structure prediction, structural alignment tools, homology modeling, drug design. Applications of Bioinformatics: pharmaceutical industry, immunology, agriculture, forestry, basic research, cheminformatics in biology, geoinformatics, legal ethical and commercial considerations.

Reference:

1. *Introduction to Protein structure*: Branden and Tooze 1.
2. *Biophysics*-Hoope W etal
3. *Molecular Biophysics*- Volkenstain M.V
4. *Introduction to Thermodynamics Of Irreversible Process*-Joh Wiley
5. *Statistical Methods In Biology*- Briley N.J.T
6. *Introduction to Biophysics*-Sokal R.R & Rohl F.J
7. *Bioinformatics: Sequence and Genome Analysis*- David Mount, Cold Spring Harbour Lab Press, New York.
8. *Bionformatics and Molecular Evolution*: Paul G Higgs, Teresa K Attwood.Blackwell pub.