PBT6J002 MOLECULAR MODELING AND DRUG DESIGNING

Module-I:

Introduction to Molecular Modelling and its applications Biomolecular modeling problems: protein folding, protein misfolding, nucleic acid/ protein interactions, and RNA folding. Basic concepts of quantum mechanics, ab initio, semi-empirical and density functional theory calculations, Molecular size versus accuracy. Approximate molecular orbital theories. Molecular mechanisms, energy calculations, Bond stretch, Angle bending, torsional terms, Electrostatic interaction- Van der waals interactions. Miscellaneous interactions.

Module-II:

Introductionto molecular dynamics and simulations; Molecular Dynamics using simple models; Dynamics with continuous potentials, Constant temperature and constant dynamics; Conformation searching and systematic search; Monte-carlo simulation of biomolecules and bio-polymers.

Comparative modeling of protein: by homology- the alignment, construction of frame work, selecting variable regions, side chain placement and refinement, validation of protein models – Ramchandran plot, threading and ab initio modeling.

Module-III:

Analog based drug designing : Introduction to QSAR. lead module, linear and nonlinear modeled equations, biological activities, physicochemical parameter and molecular descriptors, molecular modelling in drug discovery.

Structure based drug designing: 3D pharmacophores, molecular docking, De novo Ligand design, Free energies and solvation, electrostatic and non-electrostatic contribution to free energies. 3D data base searching and virtual screening, Sources of data, molecular similarity and disimilarity searching, combinatorial libraries – generation and utility.

Text Book:

1. A R Leach, Principles and applications of modeling, Prentice Hall.
2. Hans Pieter, Heltje & Gerd Folkens, Molecular Modelling, VCH.

References:

1. Jonathan Good man, Chemical Applications of Molecular Modelling, Cambridge Press