

PBT6D001 PROTEIN ENGINEERING AND ANALYSIS (HONORS)

Module- I

Overview of protein structure and its hierarchical architecture; Protein engineering – definition, applications; Forces stabilizing proteins – Van der waals, electrostatic, hydrogen bonding and weakly polar interactions, hydrophobic effects. Structural features of protein, Ramachandran map, Protein-protein, Protein-DNA, protein-ligand interactions. Protein structure-function relationship.

Stability of Protein Structure: Laws of thermodynamics, heat, energy and work, chemical equilibrium flexibility, reversible folding and unfolding, pH titration, chemical denaturation, thermal denaturation, solvent perturbation and chemical modification,

Module-II

Features or characteristics of proteins that can be engineered- affinity and specificity;

Experimental methods of protein engineering: Rational designing, Directed evolution like site directed mutagenesis, Module shuffling, Guided protein recombination, etc.; Computational approaches to protein engineering. Mechanism of stabilization of proteins from psychrophiles and thermophiles vis-à-vis those from mesophiles; Protein and enzyme engineering case studies for its stability, specificity and affinity- Protease, Lipase and Lysozyme. Role of solvent.

Module-III

Characterization of proteins: NMR spectroscopy, crystallography, spectroscopic (UV-Vis, CD, IR, Florescence), calorimetric methods, Viscometry, Molecular sieve chromatography, electrophoresis, EPR in protein structure and function analysis with example.

Text Books /References:

1. Edited by T E Creighton, Protein structure: A practical approach, 2nd Edition, Oxford press.
2. Edited by T E Creighton, Protein function. A practical approach, 2nd Edition, Oxford university press.
3. Edited by T E Creighton, Protein function. A practical approach. Oxford university press.
4. Cleland and Craik, Protein Engineering, Principles and Practice, Vol 7, Springer Netherlands.
5. Mueller and Arndt., Protein engineering protocols, 1st Edition, Humana Press.
6. L. Alberghina, Protein Engineering for industrial biotechnology, Harwood Academic Publisher