Subject Code : P8BI6

CC-VI - COMPUTATIONAL BIOLOGY

UNIT - I

Sequence alignment algorithms: pairwise alignment - Local and Global alignment concepts - dynamic programming methodology-Needleman and Wunsch algorithm, Smith-Waterman algorithm -– Databases searches for homologous sequences - FASTA and BLAST - Statistics of alignment score – p-value – E- value

UNIT - II

Multiple sequence alignment – methods of multiple sequence alignment Progressive alignment – Clustal W, T-Coffee – Application of multiple sequence alignment - PRINTS, BLOCKS, PRINTS, PRODOM, PFAM – principles and methods – methods for phylogenetic tree construction – NJ, ML and MP – evolutionary models

UNIT – III

Protein 3-D structure comparison and alignment – structure superposition – RMSD – structure alignment methods – DALI, SSAP, CE – multiple structure alignment

UNIT - IV

Protein Secondary structure prediction – Chou-Fasman, Garnier-Osguthorpe- Robson (GOR) methods – Neural network concepts and secondary structure prediction – amphipathic helix prediction – transmembrane structure prediction

UNIT - V

Fragment assembly - Genome sequence assembly - Gene finding methods: content and signal methods – Analysis and prediction of regulatory regions - - Probabilistic models: Markov chain – random walk - Hidden Markov models – Gene identification and other applications.

Reference Books

1. Arthur M. Lesk, Introduction to Bioinformatics, Oxford University Press, New Delhi (2003).
2. David W. Mount, Bioinformatics – Sequence and Genome analysis, Cold Spring Harbor Laboratory Press, New York, 2001.
3. D. Higgins and W. Taylor (Eds), Bioinformatics- Sequence, structure and databanks, Oxford University Press, New Delhi (2000).
4. R. Durbin, S.R. Eddy, A. Krogh and G. Mitchison, Biological Sequence Analysis, Cambridge Univ. Press, Cambridge, UK (1998).
5. A. Baxevanis and B.F. Ouellette. Bioinformatics: A practical Guide to the Analysis of Genes and Proteins, Wiley- Interscience, Hoboken, NJ (1998).
6. Michael S. Waterman, Introduction to computational Biology, Chapman & Hall, (1995).
7. P.E. Bourne and H. Weissig (Eds.) Structural Bioinformatics, John-Wiley and Sons, 2003
8. C. Gibas and P. Jambeck, Developing Bioinformatics Computer Skill, 1st Edition, O'Reilly, 2001O'Reilly, 2001.