Introduction to Bioinformatics

This is a four credit course, which includes class room teaching, practical laboratory experiments and industry visits. It can be selected individually by the students and does not comprise a consolidated course program.

Prerequisites: Basic biological science background.

Evaluation: Continuous evaluation which includes seminars, practical experiments, field visits, reports, discussions, debates and at least two written tests

Learning objectives: The course aims at giving an overview of bioinformatics. The students will gain an understanding of the importance of bioinformatics, the different databases and their applications. In addition, the basics of the various algorithms and tools used for database analysis, phylogenetic trees and their significance will be gained. Nucleotide and protein sequence analysis and protein structure prediction can be understood.

Unit I

Introduction to Bioinformatics/ Computer Fundamentals /Informatics for Biology/ Networking & Hardware fundamentals/ Internet, World Wide Web

Unit II

Biological Databases - Online databases and tools for Bioinformatics - theory and management, file formats for sequence databases. Tools for alignment and modeling. Stand alone packages for sequence analysis and structure prediction. Molecular visualization software. Major web resources for Bioinformatics.

Unit III


Unit IV

Phylogenetic trees - Introduction, Molecular Phylogenetics, Tree definitions, Optimality criteria, Distance matrix methods and parsimony. Multiple sequence alignments - tree alignments, star alignments, pattern in pair wise alignment, genetic algorithm
Unit V
Nucleotide sequence analysis- tools and methods, prediction of genes and protein coding regions, conserved sequence pattern discovery, Whole genome analysis. Protein sequence analysis- structure prediction methods. Definition of protein families, Sequence vs family comparison.

Protein families and classification, Patterns, Profiles, Prediction of transmembrane regions. Molecular modelling, Online modelling servers (eg-SWISSMOD). Genome sequencing strategies.

Unit VI
Microarrays, Proteomics, protein structure based targeted drug design - small molecular interactions and docking. Statistics

References:
1. Introduction to Protein structure-by C.I. Branden and J. Tooze-Garland Publishers
2. Bioinformatics: Sequence and Genome Analysis. By David W Mount
6. Microarray Bioinformatics – Dovstekel