



BIOINFORMATICS CENTER (BIC)

Sri Venkateswara College

(University of Delhi)

Certificate Program in Bioinformatics & Computational Biology 2008-09

Unit I: Computer Fundamentals for Biologists

Lecture:

Computer Fundamentals: Operating Systems, Programming Languages, IP Address, Connectivity, Mirrors & Internet, Intranet & Role of Supercomputers in Biology

Hands on Session:

1. Hardware of Computer
2. Working in a Unix Operating System

Unit II: Bioinformatics & Computational Biology – An Overview

Lecture:

The 'omics 'era- Genomics, Proteomics, Metabolomics, Cellomics, Systems Biology, Medical Informatics, Applications - Bioinformatics & Agriculture, Bioinformatics and Health care, Bioinformatics & Biodiversity

Hands on Session:

1. Visualization Softwares – Rasmol, JMOL – To view 3D structures of biomolecules in various visualization packages available online.
2. Molecule Builder – 2D and 3D using softwares like ISIS Draw and HyperChem

Unit III: Biological Databases and Archives

Lecture:

Sequence Databases; structure Databases, Plant databases, Microbial databases, and Eukaryotic databases, Human Genome, HGP

Hands on Session:

1. Protein databank (PDB): File format, Structure, Sequence of proteins, Retrieval of protein structure & sequences
2. Nucleic acid database (NDB): Structure, Sequence of nucleotides, Retrieval of DNA and RNA sequences from databases
3. GenBank: Whole Genome sequences of bacterial (*E.Coli*, Mycobacterial) , viral , plant genomes (Rice, Cotton) , their retrieval from databases &

Unit IV: Genomics

Lecture:

Genome and Genes, Gene Organization, Prokaryotic and Eukaryotic gene structure, Control Switches, ORF, Promoters, ESTs, Genome Analyses, Gene Prediction, Statistical Models, Mathematical Models, Chemical Models, Sequence Alignment, Comparative Genomics, Genomics in preservation of endangered species, SNPs.

Hands on Session:

1. Sequence Alignment: Pairwise and Multiple sequence alignment using BLASTn
2. Gene Prediction Softwares: GeneScan, GLIMMER

Unit V: Proteomics

Lecture:

Atomic view of proteins, The hierarchical nature of protein architecture, protein folding, Protein Structure Prediction, Homology models, Threading/ Fold Recognition, Ab-initio models, Protein-protein interactions, Proteins as drug targets, Phylogenetic Analyses.

Hands on Session

1. Retrieval of a protein sequence from protein database
2. Sequence Alignment: Pairwise and Multiple sequence alignment using BLASTp, CLUSTALW
3. Secondary Structure Prediction: Softwares like GOR, nnPredict
4. Tertiary structure Prediction: Softwares like SWISSMODEL
5. Phylogenetic Analyses: using Packages like Phylip (Building a phylogenetic tree)

Unit VI: Computer-aided drug design

Lecture:

Individualized medicine, Disease, Drug targets, Active site Identification, Molecular recognition, Drug discovery process, Leads and drugs, Drug-like filters, Ligand docking, Biomolecular Interactions, (viz. DNA-protein interaction, protein-protein interaction, protein-ligand interaction and protein-cofactor interaction), Thermodynamics and kinetics of protein–drug binding, Molecular Modeling and Simulation.

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