SARDAR PATEL UNIVERSITY
Programme: MSC (Integrated Biotechnology)
Semester: V
Syllabus with effect from: June 2012

Paper Code: PS05CIGB04	Total Credits: 3
Title Of Paper: Bioinformatics & Structural Biology	

Unit	Description in detail	Weightage (%)
1	**Biological Databases:** Overview of available Bioinformatics resources on the web (NCBI, EBI, EXPASY etc.); Biological Databases: Nucleic Acid Sequence Databases-GenBank /EMBL/DDBJ; Protein Sequence databases-NBRF-PIR, Uniprot KB; Database search Engines (Entrez, SRS); Genome databases and related data resources (EST, STS, GSS, HSS, etc.): Nature and type of data, organization of data in databases, genome data visualization (with emphasis on human genome)	
2	**Sequence analysis:** Concepts in sequence analysis: Pairwise sequence Alignment algorithm (Needleman & Wunsch; Smith & Waterman); Scoring Matrices for nucleic acids and proteins: PAM250, BLOSUM62, Database similarity searches-BLAST, FASTA; Multiple sequence Alignment: CLUSTAL W; Derived data bases-Prosite, BLOCKS, Pfam/ Prodom, Basic concepts in Taxonomy and Phylogeny, Concepts in classical taxonomy, Phylogenetic analysis algorithms (Maximum Parsimony, UPGMA).	
3	**Structural Bioinformatics:** Overview of macromolecular x-ray crystallography: Principles of crystallography, Co-ordinate systems, Fitting and refinement, Validation, Analysis of 3D structures; Data submission to PDB, Ramchandran Plot, secondary, tertiary and quarternary structures, motif, domains; Principles of protein folding; RNA structure.	
4	**Molecular Modeling:** Protein Classification: CATH, SCOP; Protein structure prediction: Ab initio methods, Homology modeling, Fold recognition; Prediction of RNA secondary structure, Data banks: – PDB, NDB, CSD, Molecular interaction of protein: – protein, protein-carbohydrate, protein-DNA, DNA-small molecules**.**	
	Practical:	
	- Introduction of different database of NCBI, - Protein Sequence Databases (PIR, SwissProt) - Introduction of PIR, ExPasy, EMBL, SCOP, CATH - Database introduction-Prosite, BLOCKS, Pfam/ Prodom - Introduction of Genome browser – UCSC, ensemble, vista - Use of L-ALIGN - Alignment using BLAST - Clustal-W and Phylogenetic Analysis - Visualization by RASMOL & SPDBV - Homology modeling - Docking - Ramchandran Plot	

Basic Text & Reference Books:

- Mount DW, Bioinformatics: Sequence and Genome Analysis (2nd edition). Spring Harbor Press.
- Arthur Lesk. Introduction to Bioinformatics. Oxford Uni. Press.
- Rastogi. Bioinformatics : Methods and Applications.
- Ghosh Z and Mallick B, Bioinformatics-Principles and Applications, Oxford University. Press (First Print: 2008; Second Print: 2009)
- Creighton TE, Protein Structure: A Practical Approach
- Creighton TE, Protein Structure and Molecular Properties, Freeman
- Leach AR, Molecular Modeling : Principles and Application
- Bourne PE, Weissig H, Structural Bioinformatics, Wiley Schlick T. Molecular Modelling and Simulation An Inter disciplinary Guide, Springer
- Pevzner PA Computational Molecular BiologyAn Algorithmic Approach. Prentice Hall
- Thomas Lengauer ,Bioinformatics - From Genomes to Therapies: Volume 1