## II Year B.Tech Biotechnology Sem-IV

Subject: Concepts In Bioinformatics  
Course Code: BI-301  
Faculty: Mrs. Shital Pandit

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topics</th>
<th>No Of Lectures</th>
<th>Lecture Serial No</th>
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</table>
| **Unit-1** Overview of Bioinformatics | Scope and fields of Bioinformatics  
|                               | Contribution to different problems in biology                        | -2             |                  |
|                               |                                                                         | -2             |                  |
| **Unit-2** Data acquisition, Database content, structure and annotation: | File formats  
|                               | Annotated sequence databases  
|                               | Genome and Organism specific database                                | -2             | 5-6              |
|                               |                                                                         | -1             | 7                |
|                               |                                                                         | -3             | 8-10             |
| **Unit-3** Retrieval of Biological Data | Data retrieval with Entrez and DBGET/ LinkDB , Data retrieval with SRS etc. | -3             | 11-13            |
|                               |                                                                         | -3             | 14-16            |
| **Unit-4** Introduction to nucleic acid and protein databases | NCBI, EMBL, DDBJ, EBI  
|                               | NBRF-PIR, SWISSPROT, PDB etc.                                          | -5             | 17-21            |
|                               |                                                                         | -3             | 22-24            |
| **Unit-5** Database similarity searches | BLAST ,  
|                               | FASTA                                                                | -1             | 25               |
|                               | PSI-BLAST algorithms                                                   | -1             | 26               |
|                               |                                                                         | -1             | 27               |
| **Unit-6** Pairwise sequence alignment | Clustering algorithm  
|                               | PRAS                                                                 | -2             | 28-29            |
|                               | Other MSA                                                             | -1             | 30               |
|                               |                                                                         | -1             | 31               |
| **Unit-7** Multiple sequence alignment | Clustering algorithm,PRAS, Other MSA                                  | -4             | 32-35            |
| **Unit-8**                       | Derivation and searching.                                             | -1             | 36               |
Patterns, Motifs, and Profiles

- Derived Databases of patterns, motifs and profiles
  - Prosite, Blocks, Prints, Pfam etc.

Unit-9
Introduction to phylogenesis

- Phylogenetics, cladistics and ontology
- Building phylogenetics trees
- Evolution of macromolecular sequences

Unit-10
Introduction to structural Bioinformatics

- Amino acids, Polypeptide Composition, Secondary Composition
- Backbone flexibility $\varphi$ & $\psi$ Angles
- Ramachandran Plot Tertiary & Quaternary Structure
- Hydrophobicity, Disulphide bonds, Active Sites

Unit-11
Introduction to

- Homology, Analogy, Orthology
- Paralogy, Xenology

Total Lectures 48

Books recommended:

1) Computer Networking: Andrews Tenanban

Evaluation scheme

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<tr>
<th>Sno</th>
<th>Examination</th>
<th>Time</th>
<th>Marks</th>
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<tbody>
<tr>
<td>1</td>
<td>Minor test 1</td>
<td>45 Minutes</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Minor test 2</td>
<td>45 Minutes</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Internal &amp; Assignment</td>
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<td>40</td>
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<tr>
<td>4</td>
<td>Final Assessment</td>
<td>2.5 hr</td>
<td>60</td>
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<tr>
<td>5</td>
<td>Total</td>
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Books Recommended

- Introduction to Bioinformatics Kothekar V.
- Introduction to Bioinformatics By T. K.Attawood & D.J.Parry-smith
- Bioinformatics By Arthur Lesk.
- Instant notes in Bioinformatics by S. Sundara rajan & R.Balaji
Practicals In Concepts In Bioinformatics:

LIST OF PRACTICALS

1. Introduction to Nucleic Acid and Protein Sequence Data Banks
   • NCBI
   • EMBL
   • DDBJ
   • EBI
   • NBRF-PIR,
   • SWISSPROT,
   • PDB etc.

2. Database Similarity Searches:
   • BLAST
   • FASTA
   • PSI-BLAST algorithms

3. Multiple sequence alignments –
   • Clustering algorithm
   • PRAS
   • Other MS

4. Patterns, motifs and Profiles in sequences:
   • PROSITE
   • BLOCKS
   • Prints
   • Pfam etc.

5. Data Structure Algorithms