## II Year M.Tech Biotechnology Sem-IV

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

### Table of Topics

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topics</th>
<th>No Of Lectures</th>
<th>Lecture Serial No</th>
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| **Unit-1**  
Overview of Bioinformatics | Scope and fields of Bioinformatics  
Contribution to different problems in biology | -2  
-2 | 4 |
| **Unit-2**  
Data acquisition, Database content, structure and annotation: | File formats  
Annotated sequence databases  
Genome and Organism specific database | -2  
-1  
-3 | 5-6  
7  
8-10 |
| **Unit-3**  
Retrieval of Biological Data | Data retrieval with Entrez and DBGET/ LinkDB , Data retrieval with SRS etc. | -3  
-3 | 11-13  
14-16 |
| **Unit-4**  
Introduction to nucleic acid and protein databases | NCBI, EMBL, DDBJ, EBI NBRF-PIR, SWISSPROT, PDB etc. | -5  
-3 | 17-21  
22-24 |
| **Unit-5**  
Database similarity searches | BLAST , FASTA PSI-BLAST algorithms | -1  
-1  
-1 | 25  
26  
27 |
| **Unit-6**  
Pairwise sequence alignment | Clustering algorithm PRAS Other MSA | -2  
-1  
-1 | 28-29  
30  
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.
  - 1 37
  - 2 38-39

Unit-9
Introduction to phylogenesis

- Phylogenetics, cladistics and ontology
  - 1 40
- Building phylogenetics trees
  - 1 41
- Evolution of macromolecular sequences
  - 1 42

Unit-10
Introduction to structural Bioinformatics

- Amino acids, Polypeptide, Composition, Secondary Composition Backbone flexibility ϕ & ψ Angles, Ramachandran Plot Tertiary & Quaternary Structure
  - 1 43
- Hydrophobicity, Disulphide bonds, Active Sites
  - 1 44

Unit-11
Introduction to

- Homology, Analogy, Orthology
  - 1 47
- Paralogy, Xenology
  - 1 48

Total Lectures

- 48

Books recommended:
1) Computer Networking: Andrews Tenanban

Evaluation scheme

<table>
<thead>
<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>
<td></td>
<td>100</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