IV Year B.Tech. Biotechnology I - Semester	L	T	P	To	C
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BT 401 BIOINFORMATICS

Course Description & Objectives:

To equip students with computational skills and to help them use computational methods to study, organise, analyse and interpret biological information at molecular, genetic and genomics levels.

Course Outcomes :

This course contributes to the development of the following program learning outcomes

1. Will demonstrate an advanced understanding of biological sciences by articulating the methods of science, explaining why current biological knowledge is both contestable and testable through further inquiry, and explaining the role and relevance of biotechnology in society.
2. Will have an understanding of recent developments in a specialized area of biotechnology
3. Advanced skills to critically analyze and solve problems in biotechnology.
4. Will demonstrate cognitive skills in mastery of advanced theoretical knowledge in biotechnology and apply this knowledge to solve complex problems in existing and new areas.
5. Will be able to query biological data, interpret and model biological information and apply this to the solution of biological problems in any arena involving molecular data.

UNIT I: Introduction to Bioinformatics :

Basics of Bioinformatics, Elementary commands and protocols, ftp, telnet, http,html. Scope of Bioinformatics.

UNIT II: Sequencing Alignment & Dynamic Programming

Heuristic Alignment algorithms. Global sequence alignments - Neddleman - Wunsch Algorithm, Smith - Waterman Algorithm - Local sequence alignments (Amino acid substitution Matrices (PAM, BLOSUM).

UNIT III: Biological Databases & Their Use

Introduction to Biological databases, Organization and management of databases. Searching and retrieval of information from the World Wide Web. Structure databases - PDB (Protein Data Bank), Molecular Modeling Databases (MMDB). Primary Databases NCBI,EMBL, DDBJ,Introduction to Secondary Databases Organization and management of databases Swissprot, PIR,KEGG,Introduction to BioChemical databases-organization and Management of databases. KEGG, EXPASY,BRENDA, WIT.

UNIT IV: Evolutionary Trees & Phylogeny

Ultrasonic trees – parsimony – Ultrametric problem – Perfect phylogeny – Phylogenetic alignment – connection between multiple alignment and tree construction.

UNIT V: Applications of Bioinformatics

DNA Mapping and sequencing –Map alignment – Large scale sequencing and alignment – Shotgun – DNA sequencing – Sequence assembly – Gene predictions – Molecular predictions with DNA strings.

TEXT BOOKS:

1. D. Baxivanis and Foulette - Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, Wiely Indian Edition, 2001.
2. Mount. D. - Bioinformatics: Sequence and Genome Analysis, Indian Edition, Cold Spring Harbor Lab, 2001.

REFERENCE BOOKS:

1. C S V Murthy - Bioinformatics, 1st Edition , Himalaya Publishing House, 2003.
2. Harshawardhan P. Bal - Bioinformatics – Principles and Applications, First Reprint, Tata McGraw-Hill, 2006.
3. T K Attwood, D J parry-Smith, Introduction to Bioinformatics, Pearson Education, 1st Edition, 11th Reprint 2005.