

COURSE TITLE	BIOLOGICAL DATABASES
COURSE CODE	01CB0105
COURSE CREDITS	3

Objective:

- 1 Develop basic knowledge of the available online biological databases. Experiment with all kinds of nucleotide and protein databases and make the best use of them.

Course Outcomes: After completion of this course, student will be able to:

- 1 Apply the concepts of biological databases, RDBMS, and data formats.
- 2 Utilize bioinformatics tools and databases to retrieve and interpret biological data.
- 3 Employ database resources to compare and annotate genes, proteins, and pathways.
- 4 Analyze nucleotide and protein data from various biological databases.
- 5 Evaluate the quality, relevance, and limitations of biological databases.

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Introduction Relational database- Motivation of biological database, RDBMS, DBMS, File formats of different Dbs, Submission of Data to Databases	6
2	Understanding Molecular Biology Dbs European Molecular Biology Laboratory (EMBL) , NCBI GenBank – DNA Data Bank of Japan (DDBJ), Genes and genetic disorders: COSMIC, Clinvar, HUMSAVAR- SNP database (DbSNP).	5
3	Protein Databases Protein Databases , UniProt Knowledgebase: SwissProt/TrEMBL - Protein Information Resource (PIR), PRIDE Database	5
4	History of structural biology Protein Data Bank (PDB), contents of a PDB file- SCOP: SCOP: Structural Classification of Proteins - CATH : Protein Structure Classification database	5
5	Protein family databases (pfam), GO-gene ontology, PROSITE protein function pattern, and profile, ENZYME-Enzyme commission, KEGG Pathway database	7
Total Hours		28

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment 1 To compare different types of biological file formats	2
2	Experiment 2 To compare outputs of databases like EMBL, GenBank, and DDBJ	2
3	Experiment 3 To identify nucleotide sequence and convert sequences from one format to another using bioinformatics tools	2
4	Experiment 4 To analyze genetic variants and disorders in sequences	2
5	Experiment 5 To compare genes from UniProt Knowledgebase, including SwissProt and TrEMBL	2
6	Experiment 6 To perform retrieval of protein-related data and annotations from databases	2
7	Experiment 7 To analyze Protein Data Bank (PDB) contents for five classes of proteins	2
8	Experiment 8 To analyze proteins from SCOP (Structural Classification of Proteins)	2
9	Experiment 9 To compare proteins from CATH (Protein Structure Classification database)	2
10	Experiment 10 To perform comparison based on structure from PDB and PDBbind	2
11	Experiment 11 To compare information on protein families and domains using MEME	2
12	Experiment 12 To Analyse PROSITE for protein function pattern and profile information	2
13	Experiment 13 To analyze ENZYME for Enzyme Commission information	2
14	Experiment 14 To compare and annotate proteins based on their functions	2
Total Hours		28

Textbook :

- 1 Introduction to bioinformatics, Attwood TK and Parry-Smith DJ, Pearson Education, 2014
- 2 Bioinformatics: a practical guide to the analysis of genes and proteins., Baxevanis A., Ouellette F.B.F. (Eds.) , John Wiley and Sons., 1998

References:

- 1 Bioinformatics: Sequence and Genome Analysis,, Bioinformatics: Sequence and Genome Analysis,, Mount D, Cold Spring Harbor, 2014

Suggested Theory Distribution:

The suggested theory distribution as per Bloom’s taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
0.00	0.00	35.00	35.00	30.00	0.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Supplementary Resources:

- 1 <https://microbenotes.com/biological-databases-types-and-importance/>
- 2 <https://training.galaxyproject.org/videos/watch.html?v=data-science/tutorials/online-resources-gene/slides>