CENTRE FOR ADVANCED TRAINING AND RESEARCH, LUCKNOW INDIA

BIOINFORMATICS COURSE MODULE

S.NO.	Name of the topic	Main Category
UNIT-I Introduction of Bioinformatics		
1.	Basic Molecular Biology (Central Dogma)	Introduction
2.	Introduction and Applications of Bioinformatics	Introduction
3.	Origin, History, and Scope of Bioinformatics	Introduction
UNIT-II Data, Database and Database Mining Tools in Bioinformatics		
4.	Importance of Data and Databases in Bioinformatics	Databases
5.	Different types of Databases	Databases
6.	Nucleotide Databases	Databases
7.	Protein Databases	Databases
8.	Structural Databases and Enzyme Databases	Databases
9.	Bibliographic Databases	Databases
10.	Clinical Databases	Databases
11.	Expression Databases	Databases

UNIT-III Sequence Retrieval from Sequence Database		
12.	Sequence Retrieval from NCBI Entrez	Bioinformatics Databases
13.	GenBank: Nucleotide Database on NCBI	Bioinformatics Databases
14.	FASTA vs. GenBank	Bioinformatics Databases
15.	Gene Database: A Comprehensive Gene Database	Bioinformatics Databases
16.	NCBI Genomes & NCBI Assembly: Retrieval of Genomes	Bioinformatics Databases
17.	Retrieval of a Gene-Protein-Chromosomal Region	Bioinformatics Databases
18.	RefSeq Database: Retrieval of Single Reference Sequences	Bioinformatics Databases
19.	Introduction to dbSNP	Bioinformatics Databases
20.	ClinVar database	Bioinformatics Databases
21.	GEO (Gene Expression Omnibus)	Bioinformatics Databases
22.	GenBank (Sequence Annotation Format) FASTA (Sequence Format)	Bioinformatics File Formats
23.	Gene File Format/Gene Transfer Format	Bioinformatics File Formats
24.	SDF and Mol File Format	Bioinformatics File Formats
25.	PDB File Format	Bioinformatics File Formats
26.	Introduction to MolecularModeling Database (MMDB)	Protein Databases & Analysis
27.	Introduction to UniProt	Protein Databases & Analysis
28.	UniProtKB & Protein Analysis	Protein Databases & Analysis
29.	Introduction to Protein Data Bank (PDB)	Protein Databases & Analysis

30.	Accurately Searching for a Protein Structure on PDB & Protein Analysis	Protein Databases & Analysis
31.	Introduction to InterPro	Protein Databases & Analysis
32.	InterPro - Protein Family	Protein Databases & Analysis
UNIT-IV Sequence Analysis-Comparative Tools		
33.	Introduction of Sequence Alignment	Sequence Alignment & Analysis
34.	Local and Global Sequence Alignment	Sequence Alignment & Analysis
35.	BLAST Database Searching	Sequence Alignment & Analysis
36.	EMBOSS NEEDLE: Global Alignment of Sequences	Sequence Alignment & Analysis
37.	Clustal Omega: Most Reliable Multiple Sequence Alignment Tool	Sequence Alignment & Analysis
38.	Clustal Omega Alignment Format	Bioinformatics File Formats
39.	MEGA - Multiple Sequence Alignment	Sequence Alignment & Analysis
40.	MEGA (Alignment Format)	Bioinformatics File Formats
41.	Mega (Phylogenetic Analysis)	Phylogenetic Analysis
UNIT-V PREDICTION and Analysis TOOLS		
42.	ORF finding tool	Gene Analysis
43.	Prediction of potential cleavage sites by ExPasy web tool	Gene Analysis
44.	Secondary structure prediction tool	Structure Analysis

45.	PubChem and Drug bank Introduction and analysis	Chemoinformatic Databases and Analysis
46.	Introduction of Pharmacokinetics and Lipinski's Rule of Five (Druggability)	Chemoinformatic Databases and Analysis
47.	Properties prediction of Ligands/Drugs/Metabolites/Synthetic Compounds	Pharmacokinetics analysis/ Drug Designing
48.	Toxicity and Drugs ADME properties prediction tools SwissADME, ProToX-II	Pharmacokinetics analysis/ Drug Designing
49.	ADMET Lab 4.0 (Big Data Analysis)	Pharmacokinetics analysis/ Drug Designing
UNIT-VI Computer-Aided Drug Designing Approach (Molecular Docking of Protein and Ligand)		
50.	Introduction of Computer-Aided Drug Design	Drug Designing
51.	Preparation of Protein Target by Maestro tool	Drug Designing
52.	Active Site Prediction	Drug Designing
53.	Interconversion of various files Conversion using software	Drug Designing
54.	Molecular Docking Analysis	Drug Designing
55.	Installation of Software for CADD	Drug Designing
56.	Analysis of Drug Vs Target (Binding Affinity) by AutoDock	Drug Designing
57.	Binding Energy and Inhibition constant	Drug Designing

58.	Analysis of Interactive Amino Acids	Drug Designing
59.	Analysis of H-Bond Interactions	Drug Designing
60.	Pose Selection	Drug Designing
61.	Results interpretation	Drug Designing