STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI
COURSE PLAN June - November 2024

Department : Bioinformatics
Name/s of the Faculty : Ms. Pujaa B
Course Title : Proteomics and Metabolomics
Course Code : 23BI/PC/PM34
Shift : II

COURSE OUTCOMES (COs)

COs	Description	CL
CO1	Gain an insight of the basic and advanced concepts and applications of proteomics and metabolomics	K1
CO2	Understand the mechanisms of integrating proteomics and metabolomics data with the previously learnt omics techniques	K2
CO3	Apply functional genomics techniques to analyze proteome and metabolome data for biological system	K3
CO4	Deduce differential abundances in proteome and metabolome during health and disease	K4
CO5	Analyze the proteomic and metabolomics interactions in complex disease	K5, K6

Week	Unit No.	Content	Cognitive Level	Teaching Hours	COs	Teaching Learning Methodology	Assessment Methods
Jun 19 – 26, 2024 (Day Order 1 - 6)	1	**Proteomics** 1.1. Introduction to Proteomics - Proteins structure, Organization of protein structure, structural conformation of proteins, three dimensional structures of proteins. Practical -Protein classification and structure analysis –Chou Fasman, GOR, Procheck	K1-K2	6	1-5	Lecture, Power Point presentations and Demonstration	Discussion and Practical test
Jun 27 – July 4, 2024 (Day Order 1 - 6)	1	1.2. Protein extraction and purification - 1D and 2D-gel electrophoresis, Mass Spectrometry - ESI, MALDI, Software for Matching MS Data with Specific Protein Sequences, Peptide sequencing by tandem mass spectrometry	K2-K3	6	1-5	Lecture and Power Point presentations	III component Seminar (20 marks)
July 5 – 12, 2024 (Day Order 1 - 6)	1	1.3. Preparative IEF, Protein Digestion Techniques, Protein structure prediction - Elementary Description of Crystallography - Crystal Growth, Data Collection, Structure Solution, Refinement and Interpretation	K3-K6	4	1-5	Lecture and Power Point presentations	III component quiz (20 marks)

July 15 – 23, 2024 (Day Order 1 - 6)	2	**Computational Proteomics** 2.1. Protein Structure prediction - Secondary Structure Prediction, Homology modelling, Structure validation tools - Ramachandran Plot, Threading and ab initio method, Tools for Structure prediction Practical - Homology modelling – Swiss model, Modeller software Secondary structure prediction – JPRED, MFOLD	K1-K3	5	1-5	Lecture, Power Point presentations and Demonstration	Discussion and Practical test
July 24 – 31, 2024 (Day Order 1 - 6)	2	2.2. Protein structural visualization; Geometry optimization and Loop refinement, AI based methods- alpha fold, alpha meet Practical - Protein motif and domain search – PROSITE, PDBeMotif, MASCOT	K3-K4	5	1-5	Lecture, Power Point presentations and Demonstration	Quiz and Practical test
Aug 1 – 5, 2024 (Day Order 1 - 3)	2	2.3. Proteogenomics - overview, applications and computational resources available	K4-K6	3	1-5	Group discussion and case studies	Assignments
Aug 6 – 10, 2024	**C.A. Test - I**						
Aug 12 – 14, 2024 (Day Order 4-6)	3	**Protein-protein interactions** 3.1. Proteomic interactions - Yeast Two-Hybrid, Mammalian Screen Methods and Co-Immuno Precipitation techniques	K1-K3	3	1-5	Lecture and Power Point presentations	Discussion

Date		Unit	Topic	K Level	Hours	CO	Teaching Methodology	Assessment
Aug 16 – 23, 2024 (Day Order 1-6)	3		3.2. Protein-Protein Interactions, chaperones, protein misfolding in diseases and protein complexes. Databases and proteomic tools Practical - Protein–Protein interaction analysis – DIP, STRING, BIND, Expasy, Cytoscape	K3-K6	5	1-5	Lecture, Power Point presentations and Demonstration	Quiz and Practical test
Aug 27 – Sep 3, 2024 (Day Order 1-6)	3		3.3. Post translational modifications, top down and bottom up approaches in proteomics. Data analysis in proteomics, Applications of proteomics in Biomarker discovery, personalized medicine, astrobiology, paleo proteomics	K4-K6	5	1-5	Group discussion and case studies	Assignments
Sep 4 – 11, 2024 (Day Order 1-6)	4		**Metabolomics** 4.1. Metabolite to metabolome and metabolic reactions, importance of metabolomics and designing a metabolome study	K1-K3	3	1-5	Lecture and Power Point presentations	Discussions
Sep 12 - 20, 2024 (Day Order 1-6)	4		4.2. Metabolomic databases and web resources, Experimental methods in metabolome generation- Plant/bacterial secondary metabolites, MS based approaches, targeted and untargeted metabolomics, and experimental errors. Practical - Metabolic pathway database – KEGG, PharmGKB, Pubchem	K3-K4	5	1-5	Lecture, Power Point presentations and Demonstration	Quiz and Practical test
Sep 23 - 26, 2024 (Day Order 1-4)	4		4.3. Metabolomic categories - Lipidomics, Glycomics, Fluxomics, genome scale metabolic modelling	K4-K6	3	1-5	Group discussion and case studies	Written test and group discussion

Sep 27 – Oct 3, 2024	C.A. Test - II						
Oct 4 – 5, 2024 (Day 5 & 6)	5	5.1. Generation of metabolome data, over representation analysis and disease-based enrichment analysis.	K1-K3	3	1-5	Lecture and Power Point presentations	Written test and group discussion
Oct 7 - 15, 2024 (Day Order 1 to 6)	5	5.2. Statistical analysis in metabolomics – univariate and multivariate analysis, dimensionality reduction and differential abundance of metabolomics.	K4-K6	5	1-5	Lecture and Power Point presentations	III component Assignments (10 marks)
Oct 16 - 22, 2024 (Day Order 1 to 6)	5	5.3. Functional annotation, Softwares and tools for metabolome analysis - Mzime, metabolome analyst, paintomics.	K2-K3	4	1-5	Lecture and Power Point presentations	Assignments and Discussion
Oct 23 - 24, 2024 (Day Order 1 to 2)	REVISION						

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI
COURSE PLAN June - November 2024

Department : Bioinformatics
Name/s of the Faculty : Dr. M. Sharanya
Course Title : Machine Learning, Deep Learning and Artificial Intelligence
Course Code : 23BI/PC/MA34
Shift : II

COURSE OUTCOMES (COs)

COs	Description	CL
CO1	Demonstrate the fundamental knowledge on concepts of machine learning and deep learning	K1, K2
CO2	Utilise the different libraries available to understand the fundamental prerequisite for ML and DL	K3
CO3	Identify the right method of classification and clustering analysis specific for the datasets	K4
CO4	Enable to build a model and examine their performance using various statistical methods by training and testing to culminate Artificial Intelligence	K5
CO5	Apply the ML, DL and AI concepts to solve problems in biology and medicine	K6

Week	Unit No.	Content	Cognitive Level	Teaching Hours	COs	Teaching Learning Methodology	Assessment Methods
Jun 19 – 26, 2024 (Day Order 1 - 6)	1	Different Forms–statistics, data mining, data analysis, data science, Statistics vs. Data Mining vs. Data Analytics vs. Data Science.	K1-K4	5	1-5	PowerPoint presentation	Discussion and MCQs
Jun 27 – July 4, 2024 (Day Order 1 - 6)	1	Machine Learning perspectives of data–Scales of Measurement, data imputation, dealing with missing data, normalising data, feature generation.	K2-K5	5	1-5	Demonstration	Learning-by-doing (Other component 15 marks)
July 5 – 12, 2024 (Day Order 1 - 6)	1	Machine Learning Categories-supervised, unsupervised, reinforcement learning.	K3-K6	5	1-5	PowerPoint presentation	Discussion
July 15 – 23, 2024 (Day Order 1 - 6)	2	Exploratory data analysis –multivariate and univariate analysis, Supervised Learning concepts- Regression, correlation and causation.	K1-K4	5	1-5	Demonstration	Case Analysis
July 24 – 31, 2024 (Day Order 1 - 6)	2	Supervised Learning – Classification, ROC curve, Evaluating a Classification Model Performance, SVM, SOM and KNN.	K2-K5	5	1-5	Demonstration	Discussion and Quiz (Other component 15 marks)
Aug 1 – 5, 2024 (Day Order 1 - 3)	2	Unsupervised learning – K means, Hierarchical and random forest, evaluation – cross fold K validation.	K3-K6	3	1-5	PowerPoint presentation	Case Analysis
Aug 6 – 10, 2024	**C.A. Test - I**						
Aug 12 – 14, 2024 (Day Order 4-6)	3	Ensemble methods- bagging, boosting, Ensemble voting, stacking.	K1-K4	3	1-5	PowerPoint presentation	Discussion

Date		Topic					
Aug 16 – 23, 2024 (Day Order 1-6)	3	Text mining, data assemble, Data Preprocessing (Text) - Convert to Lowercase and Tokenize, Removing Noise, Part of Speech (PoS) Tagging, Stemming, Lemmatization, N-grams, Word2Vec, FastText, Glove.	K2-K5	5	1-5	Demonstration	Learning-by-doing
Aug 27 – Sep 3, 2024 (Day Order 1-6)	3	Transformer based architecture and models, Data Exploration, model building and evaluation.	K3-K6	5	1-5	PowerPoint presentation	Discussion
Sep 4 – 11, 2024 (Day Order 1-6)	4	Artificial Neural Network (ANN), Image Recognition with Deep Learning and Neural Networks, Perceptron–Single Artificial Neuron, Multilayer Perceptrons (Feedforward Neural Network).	K1-K4	5	1-5	PowerPoint presentation	Model display (Other Component 20 marks)
Sep 12 - 20, 2024 (Day Order 1-6)	4	Restricted Boltzmann Machines (RBM), Multilayer Perceptrons (MLP) Using Keras, tensor flow, Autoencoders.	K2-K5	5	1-5	PowerPoint presentation	Group Discussion
Sep 23 - 26, 2024 (Day Order 1-4)	4	Convolution Neural Network (CNN), Recurrent Neural Network (RNN), Long Short-Term Memory (LSTM), Transfer Learning and Reinforcement Learning	K3-K6	4	1-5	PowerPoint presentation	Case Analysis
Sep 27 – Oct 3, 2024	**C.A. Test - II**						
Oct 4 – 5, 2024 (Day 5 & 6)	5	ML, DL and AI in drug discovery and development	K1-K4	2	1-5	Research Article discussion	Case Analysis
Oct 7 - 15, 2024 (Day Order 1 to 6)	5	Approaches of ML, DL and AI in medical diagnosis and personalized medicine	K2-K5	5	1-5	Research Article discussion	Case Analysis

Oct 16 - 22, 2024 (Day Order 1 to 6)	5	Implementation of ML, DL and AI in disease prediction and prevention	K3-K6	5	1-5	Research Article discussion	Case Analysis
Oct 23 - 24, 2024 (Day Order 1 to 2)	**REVISION**						

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI
COURSE PLAN June - November 2024

Department   **: Bioinformatics**
Name/s of the Faculty   **: Dr. R. Sagaya Jansi**
Course Title   **: Molecular Modeling and Computer Aided Drug Design**
Course Code   **: 23BI/PC/MC34**
Shift   **: II**

COURSE OUTCOMES (COs)

COs	Description	CL
CO1	Interpret the protein structural features, minimize the energy and simulate to attain the stability for its importance in drug action	K1, K2
CO2	Construct and analyse the molecular dynamics and Monte Carlo simulation methods	K2, K3
CO3	Compare, categorize and examine the concepts of molecular interactions and QSAR studies	K3, K4
CO4	Determine the functional disease targets and interpret the target-ligand interactions	K4, K5
CO5	Apply the knowledge towards design and development of potential lead molecules	K5, K6

Week	Unit No.	Content	Cognitive Level	Teaching Hours	COs	Teaching Learning Methodology	Assessment Methods
Jun 19 – 26, 2024 (Day Order 1 - 6)	1	**Molecular Mechanics** 1.1. Concepts in Molecular Modeling - Molecular Representations, Coordinate Systems, Potential Energy Surfaces.	K1-K4	4	1-5	Lecture	Discussion
Jun 27 – July 4, 2024 (Day Order 1 - 6)	1	1.2. Molecular Mechanics, Force fields - Bond Length, Bond Angle and Torsion angle potential	K2-K4	3	1-5	Lecture and animations	Quiz
July 5 – 12, 2024 (Day Order 1 - 6)	1	1.3. Non- bonded Interactions-Van der Waals and Electrostatic Potential, Hydrogen bond interactions	K5-K6	3	1-5	Lecture, power point presentation and animations	Test - III component Assignment
July 15 – 23, 2024 (Day Order 1 - 6)	2	**Energy Minimization Methods** 2.1. Energy Minimization- Derivative and Non-Derivative Energy Minimization Methods.	K1-K4	4	1-5	Lecture, power point presentation and animations	Test - III component Assignment (10 marks)
July 24 – 31, 2024 (Day Order 1 - 6)	2	2.2. Calculation of Simple Thermodynamic Properties, Computer Simulation, Boundaries, Monitoring the Equilibration, Long Range Forces.	K2-K4	3	1-5	Lecture	Test and Practical
Aug 1 – 5, 2024 (Day Order 1 - 3)	2	2.3. Analyzing the Results of Simulation and Estimating Errors.	K5-K6	3	1-5	Lecture	Test and Practical
Aug 6 – 10, 2024	**C.A. Test - I**						
Aug 12 – 14, 2024 (Day Order 4-6)	3	**Pharmacophores** 3.1. Molecular structures, representation – SMILES, InChi keys, Chemical Fingerprint generation, Tanimoto coefficient.	K1-K3	5	1-5	Lecture, Group Discussion	III component-presentations

Date	Unit	Topic	K-level	Hours	CO	Teaching Method	Assessment
Aug 16 – 23, 2024 (Day Order 1-6)	3	3.2. Molecular structure similarity and diversity, Molecular Descriptors – 1D, 2D, 3D, 4D, CoMFA, COMSIA, QSAR, 3D QSAR, ADMET prediction.	K2-K4	5	1-5	Lecture and demo	III component-presentations (20 marks)
Aug 27 – Sep 3, 2024 (Day Order 1-6)	3	3.3. 3D Pharmacophore identification and mapping, Ligand-based and structure based pharmacophores, Chemical libraries, Scaffold hopping	K5-K6	5	1-5	Lecture and demo	Test Practical
Sep 4 – 11, 2024 (Day Order 1-6)	4	**Molecular Docking** 4.1. Drug discovery and development, computational approaches in drug discovery.	K1-K3	5	1-5	Lecture and animations	Group Discussion
Sep 12 - 20, 2024 (Day Order 1-6)	4	4.2. Structure Based Drug Design - Target Discovery and Validation, Active Site Prediction, Lead identification and Optimization, De Novo Drug Design.	K2-K4	5	1-5	Lecture, Case study and animations	Group Discussion
Sep 23 - 26, 2024 (Day Order 1-4)	4	4.2. Molecular docking and high throughput virtual screening.	K5-K6	5	1-5	Lecture, Case study and animations	Quiz
Sep 27 – Oct 3, 2024	**C.A. Test - II**						
Oct 4 – 5, 2024 (Day 5 & 6)	5	**Molecular Dynamics and Monte Carlo Simulations** 5.1. Molecular Dynamics Using Simple Model, Molecular Dynamics with Continuous Potentials	K1-K4	5	1-5	Lecture and PowerPoint presentations	III component-Test (20 marks)
Oct 7 - 15, 2024 (Day Order 1 to 6)	5	5.2. Molecular Dynamics at Constant Temperature and Pressure, Incorporating Solvent effects into Molecular Dynamics, Conformational Changes from Molecular Dynamics Simulation	K2-K4	5	1-5	Lecture and animations	Discussion

Oct 16 - 22, 2024 (Day Order 1 to 6)	5	5.3. Monte Carlo Simulation of Molecules, Calculation of Chemical Potential- Simulating Phase Equilibria by Gibbs Ensemble Monte Carlo Method	K5-K6	5	1-5	Lecture and animations	Discussion
Oct 23 - 24, 2024 (Day Order 1 to 2)	**REVISION**						

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI
COURSE PLAN June - November 2024

Department : Bioinformatics
Name/s of the Faculty : Dr. R. Sagaya Jansi
Course Title : Molecular Modeling and Computer Aided Drug Design - Practical
Course Code : 23BI/PC/P232
Shift : II

COURSE OUTCOMES (COs)

COs	Description	CL
CO1	Understand the importance of drug-like properties and their prediction	K1, K2
CO2	Describe the use of lead candidates and database representations	K2, K3
CO3	In silico identification of lead molecules through molecular docking, pharmacophore modeling	K3, K4
CO4	Perform the mechanics and dynamics of molecules	K4, K5
CO5	Gain practice in macromolecular simulations and perform research work in the area of computational drug design	K5, K6

Week	Unit No.	Content	Cognitive Level	Teaching Hours	COs	Teaching Learning Methodology	Assessment Methods
Jun 19 – 26, 2024 (Day Order 1 - 6)	1	**Pharmacophore modeling** Ligand Search – PubChem, Drug bank, CHEMBL, ZINC databases.	K1-K6	3	1-5	Presentation and Demonstration	Exercise
Jun 27 – July 4, 2024 (Day Order 1 - 6)	1	Chemical drawing package – Marvin Sketch. ADME prediction – Online tools (Swiss ADME, etc.).	K1-K6	3	1-5	Learning by Doing	Discussion - Exercise
July 5 – 12, 2024 (Day Order 1 - 6)	1	QSAR model prediction – In Silico tools. Pharmacophore mapping.	K1-K6	2	1-5	Simulation	Discussion - Exercise
July 15 – 23, 2024 (Day Order 1 - 6)	2	**Active site prediction** Binding Site - Cast-P	K1-K6	3	1-5	Learning by Doing	Exercise Third component (20 marks)
July 24 – 31, 2024 (Day Order 1 - 6)	2	Identification Different approaches for binding site identification Tools - POCASA	K1-K6	3	1-5	Learning by Doing	Exercise Third component
Aug 1 – 5, 2024 (Day Order 1 - 3)	2	3D ligand site, Metapocket, Ghecom.	K1-K6	2	1-5	Learning by Doing	Exercise Third component
Aug 6 – 10, 2024	**C.A. Test - I**						
Aug 12 – 14, 2024 (Day Order 4-6)	3	**Molecular Docking** Structure Based Drug Design	K1-K6	3	1-5	Learning by Doing	Exercise
Aug 16 – 23, 2024 (Day Order 1-6)	3	Molecular docking using AutoDock and pyrx.	K1-K6	2	1-5	Case Analysis	Discussion - Exercise

Aug 27 – Sep 3, 2024 (Day Order 1-6)	3	Discovery Studio	K1-K6	3	1-5	Learning by Doing	Discussion - Exercise
Sep 4 – 11, 2024 (Day Order 1-6)	4	**Molecular Visualisation**: Pymol and Chimera, Pdb file format and Parsing	K1-K6	2	1-5	Case Analysis	Discussion - Exercise
Sep 12 - 20, 2024 (Day Order 1-6)	4	Visualizing a molecule in different representations Identifying interacting residues (protein and ligand interactions) Measuring distances between atoms B-factor visualisation Image tracing and preparation.	K1-K6	2	1-5	Learning by Doing	Exercise Third component (20 marks)
Sep 23 - 26, 2024 (Day Order 1-4)	4	Geometry Optimization using SwissPdb Viewer Energy Minimization of protein molecule, Determining Maxima and Minima energy points	K1-K6	3	1-5	Case Analysis	Exercise Third component
Sep 27 – Oct 3, 2024	**C.A. Test - II**						
Oct 4 – 5, 2024 (Day 5 & 6)	5	**Molecular Dynamics** Molecular dynamics using GROMACS/NAMD	K1-K6	3	1-5	Simulation	Exercise Third component (10 marks)
Oct 7 - 15, 2024 (Day Order 1 to 6)	5	AMBER	K1-K6	3	1-5	Simulation	Discussion - Exercise
Oct 16 - 22, 2024 (Day Order 1 to 6)	5	Discovery Studio (CHARMM)	K1-K6	2	1-5	Simulation	Discussion - Exercise
Oct 23 - 24, 2024 (Day Order 1 to 2)	**REVISION**						

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI
COURSE PLAN June - November 2024

Department : Bioinformatics
Name/s of the Faculty : Dr. M. Sharanya
Course Title : Molecular Biology - Practical
Course Code : 23BI/PC/P332
Shift : II

COURSE OUTCOMES (COs)

COs	Description	CL
CO1	Utilize laboratory skills to enhance understanding of cell structure and function while participating in a group environment	K1,K2
CO2	Develop responsible conduct of laboratory skills appropriate to the field of cell and molecular biology	K2,K3
CO3	Apply the molecular biology techniques to biotechnological approaches	K3,K4
CO4	Perform the mechanics and dynamics of molecules	K4,K5
CO5	Gain practice in macromolecular simulations and perform research work in the area of computational drug design	K5,K6

Week	Unit No.	Content	Cognitive Level	Teaching Hours	COs	Teaching Learning Methodology	Assessment Methods
Jun 19 – 26, 2024 (Day Order 1 - 6)	1	Cell Fraction and Extraction of cell organelles - Chloroplast	K1-K6	3	1-5	Laboratory Experiment	Learning-by-doing
Jun 27 – July 4, 2024 (Day Order 1 - 6)	1	Extraction of DNA from Onion	K1-K6	3	1-5	Laboratory Experiment	Learning-by-doing
July 5 – 12, 2024 (Day Order 1 - 6)	1	Extraction of RNA from Yeast	K1-K6	3	1-5	Laboratory Experiment	Learning-by-doing
July 15 – 23, 2024 (Day Order 1 - 6)	2	Estimation of DNA and RNA	K1-K6	3	1-5	Laboratory Experiment	Learning-by-doing
July 24 – 31, 2024 (Day Order 1 - 6)	2	Estimation of Proteins by Lowry's Method	K1-K6	3	1-5	Laboratory Experiment	Learning-by-doing
Aug 1 – 5, 2024 (Day Order 1 - 3)	2	Estimation of Mitochondria by Assessing the Marker Enzyme	K1-K6	3	1-5	Laboratory Experiment	Exercise Third component (15 marks)
Aug 6 – 10, 2024		**C.A. Test - I**					
Aug 12 – 14, 2024 (Day Order 4-6)	3	Denaturing Proteins and Identification of Amino Acids by Thin Layer Chromatography	K1-K6	3	1-5	Laboratory Experiment	Learning-by-doing
Aug 16 – 23, 2024 (Day Order 1-6)	3	Amplification of DNA by PCR	K1-K6	3	1-5	Laboratory Experiment	Group Performance

Aug 27 – Sep 3, 2024 (Day Order 1-6)	3	Electrophoretic Techniques: Agarose Gel Electrophoresis, SDS PAGE, Southern Blotting (Demo)	K1-K6	3	1-5	Demonstration	Discussion
Sep 4 – 11, 2024 (Day Order 1-6)	4	Plant sample extraction using solvents	K1-K6	3	1-5	Laboratory Experiment	Learning-by-doing
Sep 12 - 20, 2024 (Day Order 1-6)	4	Identification of secondary metabolites	K1-K6	3	1-5	Laboratory Experiment	Exercise Third component (15 marks)
Sep 23 - 26, 2024 (Day Order 1-4)	4	Evaluation of secondary metabolites for therapeutic use	K1-K6	3	1-5	Laboratory Experiment	Data Analysis
Sep 27 – Oct 3, 2024	**C.A. Test - II**						
Oct 4 – 5, 2024 (Day 5 & 6)	5	Sample collection from different environments	K1-K6	1	1-5	Discussion	Exercise Third component (20 marks)
Oct 7 - 15, 2024 (Day Order 1 to 6)	5	Microbial isolation and culture techniques	K1-K6	3	1-5	Laboratory Experiment	Learning-by-doing
Oct 16 - 22, 2024 (Day Order 1 to 6)	5	Metagenomics analysis	K1-K6	3	1-5	Discussion	Data Analysis
Oct 23 - 24, 2024 (Day Order 1 to 2)	**REVISION**						

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI
COURSE PLAN June - November 2024

Department : Bioinformatics
Name/s of the Faculty : Dr. M. Sharanya
Course Title : Introduction to Bioinformatics
Course Code : 23BI/PE/IB23
Shift : II

COURSE OUTCOMES (COs)

COs	Description	CL
CO1	Better understanding of the Bioinformatics concepts	K1
CO2	Emphasis the application of bioinformatics and biological databases to problem solving in real research problems	K2
CO3	Understand the evolutionary concepts related to biological query	K3
CO4	Perform a complete analysis of the genes and protein	K4
CO5	Analyse the importance of protein structure and functions of enzymes in restriction mapping.	K5, K6

Week	Unit No.	Content	Cognitive Level	Teaching Hours	COs	Teaching Learning Methodology	Assessment Methods
Jun 19 – 26, 2024 (Day Order 1 - 6)	1	Introduction to Bioinformatics, Classification of biological databases, Biological data formats, Application of Bioinformatics in various fields	K1-K4	3	1-5	PowerPoint presentation	Discussion
Jun 27 – July 4, 2024 (Day Order 1 - 6)	1	Introduction to single letter code of amino acids, symbols used in nucleotides	K2-K3	3	1-5	PowerPoint presentation	Group discussion
July 5 – 12, 2024 (Day Order 1 - 6)	1	Data retrieval systems- Entrez and SRS	K3-K6	3	1-5	PowerPoint presentation	Discussion
July 15 – 23, 2024 (Day Order 1 - 6)	2	Introduction to Sequence alignment. BLAST, Multiple sequence alignment	K1-K4	3	1-5	Demonstration	Assignment (Other Component 15 marks)
July 24 – 31, 2024 (Day Order 1 - 6)	2	Structural Databases – PDB and other online tools	K2-K3	3	1-5	Demonstration	Learning-by-doing
Aug 1 – 5, 2024 (Day Order 1 - 3)	2	Visualizing tools – Rasmol, Pymol	K3-K6	2	1-5	Demonstration	Case Study (Other Component 15 marks)
Aug 6 – 10, 2024	**C.A. Test - I**						
Aug 12 – 14, 2024 (Day Order 4-6)	3	Evolutionary analysis: distances, Cladistic and Phenetic methods	K1-K4	2	1-5	PowerPoint presentation	Discussion
Aug 16 – 23, 2024 (Day Order 1-6)	3	Clustering Methods. Rooted and unrooted tree representation	K2-K3	3	1-5	PowerPoint presentation	Case Analysis

Aug 27 – Sep 3, 2024 (Day Order 1-6)	3	Bootstrapping strategies, Tools for Phylogenetic tree construction	K3-K6	3	1-5	PowerPoint presentation	Discussion
Sep 4 – 11, 2024 (Day Order 1-6)	4	Genome - Gene finding methods	K1-K4	3	1-5	PowerPoint presentation	Group Discussion
Sep 12 - 20, 2024 (Day Order 1-6)	4	Gene prediction tools	K2-K3	3	1-5	PowerPoint presentation	Discussion
Sep 23 - 26, 2024 (Day Order 1-4)	4	Repeat Sequence finder	K3-K6	2	1-5	Demonstration	Learning-by-doing (Other Component 20 marks)
Sep 27 – Oct 3, 2024	**C.A. Test - II**						
Oct 4 – 5, 2024 (Day 5 & 6)	5	Proteomics - Protein structure – levels of organisation	K1-K4	2	1-5	PowerPoint presentation	MCQ
Oct 7 - 15, 2024 (Day Order 1 to 6)	5	Protein separation techniques – SDS-PAGE	K2-K3	3	1-5	Video display	Discussion
Oct 16 - 22, 2024 (Day Order 1 to 6)	5	Restriction Enzymes and Mapping	K3-K6	3	1-5	Discussion	Presentation
Oct 23 - 24, 2024 (Day Order 1 to 2)	**REVISION**						