**TEACHING LEARNING EVALUATION PLAN: 2023-2024**

**Session: Odd Sem 2023**

| **AI & ML in BIOLOGICAL SCIENCES** | |
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| **Course Code:** **21MPE303** | Continuous Evaluation: 40 |
| **Credits: 2** | End Semester Examination: 60 |
| **L T P : 3 0 0** | **Course Type: Theory** |
| **Prerequisite: Nil** | |

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| **Unit** | **Sessions** | **Topics** | **Input/Std**  **Preparation** | **Process/**  **Methodology** | **Outcome/**  **Learning of units** | **Assessment**  **Method** |
| **I** | 1, 2 | Basics of AI and ML   * Introduction * Definition * Applications | T1/T2/R1 | Discussion and PPT | Overview of AI and ML | Quiz/ Assignment |
| 3, 4 | Data Sources   * Git Hub * IPA * STRING, | T1/T2/R1 | Discussion and PPT | Knowledge of Data sources |
| 5, 6 | * Cytoscape, * NAR * Google Scholar Data * NCBI | T1/T2/R1 | Discussion and PPT | Knowledge of Data sources |
| 7, 8, 9 | Data Analytics   * data description, * Treatment, * Visualization | T1/T2/R1 | Discussion and PPT | Knowledge of Data analytics |
| **II** | 10, 11, 12 | Artificial Intelligence-I   * Problem definition * History * Test of AI | T1/T2/R1 | Discussion and PPT | Knowledge of AI | Quiz/ Assignment |
| 13, 14, 15 | Artificial Intelligence-II   * Domains * Research Areas * Architecture * Application of AI | T1/T2/R1 | Discussion and PPT | Knowledge of AI algorithms |
| **III** | 16, 17, 18, | Intelligent Systems   * Overview * Types * Uses | T1/T2/R1 | Discussion and PPT | Knowledge of functions | Quiz/ Assignment |
| 19, 20, 21, 22 | AI task classification   * formal * Mundane * Expert | T1/T2/R1 | Discussion and PPT | Understanding of AI tasks |
| 23, 24, 25, 26, 27 | Agent & Environment   * Definition * Types of Agents * Environment * Intelligent Agents * Structure of IAs * Types of IAs | T1/T2/R1 | Discussion and PPT | Understanding of Agent & Environment |
| **IV** | 28,29,30,31 | Machine Learning   * Overview * Definition * Types of ML * Class definition | T3/ R2 | Discussion and PPT | Knowledge of ML | Quiz/ Assignment |
| 32,33,34 | Machine learning Algorithms   * linear regression * logistic regression, * decision trees * random forests; * Support vector machines | T3/ R2 | Discussion and PPT | Knowledge of ML algorithms |
| 35,36, 37, 38 | Model Evaluation Techniques   * Confusion matrix. * Accuracy. * Precision. * Recall. * Specificity * F1 score. * Precision-Recall or PR curve. * ROC | T3/ R2 | Discussion and PPT | Knowledge of Model evaluation |
| **V** | 39, 40, 41 | Applications of ML and AI: Part-I   * General Applications * Healthcare Applications * Next Gen Sequencing * Phylogeny | T3/R2/R3 | Discussion and PPT | Knowledge of Phylogeny | Quiz/ Assignment |
| 42, 43, 44, 45 | Applications of ML and AI: Part-II   * Drug Target Identification * Drug Design * Disease Classification * Promises and fallacy * R&D and future prospects | T3/R2/R3 | Discussion and PPT | Knowledge of Phylogeny |

| **BIOSTATISTICS** | |
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| **Course Code:** **21MBM302** | Continuous Evaluation: 40 |
| **Credits: 3** | End Semester Examination: 60 |
| **L T P : 3 0 0** | **Course Type: Theory** |
| **Prerequisite: Nil** | |

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| **Unit** | **Sessions** | **Topics** | **Input/Std**  **Preparation** | **Process/**  **Methodology** | **Outcome/**  **Learning of units** | **Assessment**  **Method** |
| **I** | 1, 2 | Basics of Biostatistics   * Introduction * Definition * Applications | T1/T2/R1 | Discussion and PPT | Overview of biostatistics | Quiz/ Assignment |
| 3, 4 | Data and Variables   * Representation * Parametric vs Non-parametric * Univariate/Bivariate | T1/T2/R1 | Discussion and PPT | Knowledge of variables | Quiz/ Assignment |
| 5, 6 | Representation of Data-I   * Tabular representation * Types of Tables * Numerical | T1/T2/R1 | Discussion and PPT | Knowledge of tabular representations | Quiz/ Assignment |
| 7, 8, 9 | Representation of Data-II   * Graphical representation * Bar Chart, * Histogram, * Pie Chart, * Box Plot, * Scatter Plot | T1/T2/R1 | Discussion and PPT | Knowledge of graphical representations | Quiz/ Assignment |
| **II** | 10 | Frequency and its distribution   * Definition * Frequency Distribution | T1/T2/R1 | Discussion and PPT | Understanding of frequency dist. | Quiz/ Assignment |
| 11, 12 | Measures of Central Tendency   * Mean * Mode * Median * Numerical | T1/T2/R1 | Discussion and PPT | Knowledge of Central Tendency | Quiz/ Assignment |
| 13, 14, 15 | Measures of Dispersion   * Deviation * Mean Deviation * Standard Deviation * Variation | T1/T2/R1 | Discussion and PPT | Knowledge of dispersion | Quiz/ Assignment |
| 16, 17, 18 | Problem solving   * Based on Central Tendency * Based on Dispersion | T1/T2/R1 | Discussion and PPT | Knowledge of central tendency & variations | Quiz/ Assignment |
| 19, 20, 21 | Measures of Skewness   * Definition &Types * Numerical   Measures of Kurtosis   * Definition &Types * Numerical | T1/T2/R1 | Discussion and PPT | Knowledge of distribution | Quiz/ Assignment |
| **III** | 22, 23, 24 | Probability   * Definition * Different types of Events * Numerical | T1/T2/R1 | Discussion and PPT | Understanding of Probability | Quiz/ Assignment |
| 25, 26, 27 | Probability Rules   * Multiplication Rule * Addition Rule * Conditional Probability * Bayes’ Theorem | T1/T2/R1 | Discussion and PPT | Understanding of Probability | Quiz/ Assignment |
| 28, 29, 30, 31, 32 | Probability Distributions   * Binomial Distributions * Poisson Distributions * Normal Distributions * Numericals | T1/T2/R1 | Discussion and PPT | Understanding of probability distribution | Quiz/ Assignment |
| **IV** | 33, 34,35 | Testing of Hypothesis   * Introduction * P-value * Sample, Sample Distribution, Populations Distribution, Dist. Of Sample Means | T3/ R2 | Discussion and PPT | Knowledge of Hypothesis Testing | Quiz/ Assignment |
| 36, 37 | Laying down a Hypothesis   * Overview * Types of Hypothesis * Types of Error | T3/ R2 | Discussion and PPT | Knowledge of Hypothesis Tesing | Quiz/ Assignment |
| 38, 39, 40 | Chi square test   * Chi square statistics * Chi Square distribution * Applications * Test of goodness of fit, independence and heterogeneity | T3/ R2 | Discussion and PPT | Analysis of Chi Square Test | Quiz/ Assignment |
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| **V** | 41, 42, 43 | Student t- Test   * basic understanding * for independent samples * for paired samples * Applications * Numericals | T3/R2/R3 | Discussion and PPT | Knowledge of mean comparisons | Quiz/ Assignment |
| 44, 45 | Analysis of Variance   * Introduction * One-way classification * Two way classification * Applications | T3/R2/R3 | Discussion and PPT | Analysis of Variance | Quiz/ Assignment |

**Session: Even Sem 2024**

| **Bioinformatics and Computational Biology** | | | | | | | |
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| Course Code: 21MBM203 | | | | Continuous Evaluation: 40 Marks | | | |
| Credits: 03 | | | | End Semester Examination:60 Marks | | | |
| L T P : 3 0 0 | | | |  | | | |
| Prerequisite: Nil | | | |  | | | |
|  | **Unit** | **Sessions** | **Topics** | | **Input/Std**  **Preparation** | **Process/**  **Methodology** | **Outcome/**  **Learning of units** | | **Assessment**  **Method** |
|  | **I** | 1, 2 | Basics of BI and CB   * Introduction * Definition * Applications | | T1/T2/R1 | Chalk-Talk/ PPT | Knowledge of subject | | Quiz/ Assignment |
|  | 3, 4 | Biological Databases   * Primary DBs * Secondary DBs * Specialized DBs | | T1/T2/R1 | Chalk-Talk/ PPT | Knowledge of Data sources | |
|  | 5, 6 | NCBI   * Entrez * Associated DBs * Medical Literature | | T1/T2/R1 | Chalk-Talk/ PPT | Knowledge of Data sources | |
|  | 7, 8, 9 | Information Retrieval from   * NCBI, * PubMed, * Uniprot | | T1/T2/R1 | Chalk-Talk/ PPT | Information extraction | |
|  | **II** | 10, 11 | Sequence Alignment   * Definition * Applications * Sequence Homology * Sequence Similarity versus Sequence Identity * Gap Penalty | | T1/T2/R1 | Chalk-Talk/ PPT | Knowledge of basics of Sequence Alignment | | Quiz/ Assignment |
|  | 12, 13, 14, | Pairwise Sequence Alignment   * Global alignment algorithms * Local Alignment algo. * Applications | | T1/T2/R1 | Chalk-Talk/ PPT | Knowledge of Alignment algorithms | |
|  | 15, 16, 17,18 | Multiple-Sequence alignment:   * Introduction, * methods and * applications   Database searching Tools:   * BLAST * Applications | | T1/T2/R1 | Chalk-Talk/ PPT | Knowledge of MSA | |
|  | **III** | 19-20 | Phylogenetic Analysis:   * Overview * Cladogram and Phylogram * Applications | | T1/T2/R1 | Chalk-Talk/ PPT | Knowledge of Molecular Evolution | | Quiz/ Assignment |
|  | 21, 22, 23 | Molecular Phylogeny Methods   * Molecular Clock Hypothesis * Distance Based Methods: UPGMA, Neighbour Joining and * Character Based Methods: Maximum Parsimony. | | T1/T2/R1 | Chalk-Talk/ PPT | Knowledge of Molecular Evolution | |
|  | 24, 25, 26 | Computer tools for phylogenetic analysis:   * PHYLIP * Clustal Omega   Model Evaluation Methods:   * Bootstrapping * Jack Kniffing | | T1/T2/R1 | Chalk-Talk/ PPT | Understanding of Evolution Tools | |
|  | **IV** | 27, 28 | Structural Bioinformatics:   * Definition * Levels of Protein Structure Primary, Secondary, Tertiary, and Quaternary * Experimental Techniques | | T3/ R2 | Chalk-Talk/ PPT | Knowledge of Protein structures | | Quiz/ Assignment |
|  | 29, 30, 31, 32, 33 | Determination of Protein Three-Dimensional Structure   * Homology Modeling, Threading and Fold Recognition, and Ab Initio Protein * 3D Structure Validation | | T3/ R2 | Chalk-Talk/ PPT | Knowledge of structure prediction algo. | |
|  | 34, 35 | * Protein Structure Visualization, * Critical Assessment of Protein Structure Prediction (CASP) experiments | | T3/ R2 | Chalk-Talk/ PPT | Knowledge of structure prediction competitions | |
|  | **V** | 36, 37 | Molecular Docking:   * Target Identification * Target Validation * Receptor mapping, active site analysis and pharmacophore mapping, | | T3/R2/R3 | Chalk-Talk/ PPT | Knowledge of Protein-Ligand Interactions | | Quiz/ Assignment |
|  | 38, 39, 40 | Introduction to molecular docking programs   * AutoDock, * Dock, * HEX. | | T3/R2/R3 | Chalk-Talk/ PPT | Knowledge of docking tools | |
|  |  | 41, 42, | Molecular Dynamics Simulation-I:   * Introduction * Force fields * Bonded Interactions: stretching, bond-bending, dihedral motions, out of plane angle potential * Non-bonded interaction: coulomb interactions, | | T3/R2/R3 | Chalk-Talk/ PPT | Knowledge of MDS | |  |
|  | 43, 44, 45 | Molecular Dynamics Simulation-II:   * conformational search, united atoms and cut-offs, * MD methodology, * Periodic Boundary Conditions, * Algorithm for time dependence; * Time steps, * Duration of the MD run. * Analysis of MD job * Application of MD simulation | | T3/R2/R3 | Chalk-Talk/ PPT | Knowledge of MDS | |