III Year-II Semester

L	T	P	C
3	0	0	3

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Course Objectives

- To gain foundational proficiency in Artificial Intelligence and Machine Learning techniques.
- To understand heuristic and probabilistic approaches to intelligent systems.
- To build predictive and classification models using decision trees, neural networks, and clustering methods.
- To grasp essential tools and concepts of fuzzy logic and probabilistic reasoning.

Course Outcomes

After successful completion of this course, students will be able to:

1. Formulate problems suitable for AI and ML solutions.
2. Understand how AI agents make decisions and solve problems optimally under constraints.
3. Represent knowledge formally and reason logically or probabilistically.
4. Understand classical supervised learning models and performance evaluation.
5. Gain a broad understanding of advanced ML and AI paradigms, including neural, fuzzy, and unsupervised models.

UNIT I:

Introduction to Artificial Intelligence and Machine Learning: History and evolution of AI, Applications and impact of AI in various domains, Intelligent agents: structure, environment, and rationality, Difference between AI, ML, and Deep Learning. Types of learning: supervised, unsupervised, reinforcement. ML pipeline: data collection, preprocessing, feature engineering, model training, and evaluation

UNIT II:

Problem Solving and Search Techniques: Problem representation and state space, Uninformed (blind) search: BFS, DFS, DLS, Iterative Deepening. Informed (heuristic) search: Greedy, A* algorithm. Constraint Satisfaction Problems (CSPs), Game playing: Minimax, Alpha-Beta pruning, two-player games.

UNIT III:

Knowledge Representation and Reasoning: Propositional and Predicate Logic. Inference rules,

Resolution, Semantic Tableau. Knowledge representation structures: Semantic networks, Frames, Scripts. Conceptual dependency theory, Case grammars, Introduction to Probabilistic reasoning: Bayesian networks, certainty factor theory.

UNIT IV:

Supervised Machine Learning: Learning types and workflow recap. Decision Trees: entropy, Gini, overfitting, pruning, Random Forests and ensemble basics, Linear Regression and Logistic Regression, Bias–variance tradeoff and model evaluation (accuracy, precision, recall, F1, confusion matrix).

UNIT V:

Neural Networks, SVMs, and Unsupervised Learning: Perceptron and introduction to Neural Networks, MLPs and Backpropagation (conceptual). Support Vector Machines (Linear and Kernelized – overview), Clustering: K-means, Hierarchical, Fuzzy C-means, EM Clustering, Overview: Fuzzy logic, Reinforcement Learning, NLP basics. Tools: Scikit-learn, TensorFlow basics

Textbooks:

1. Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Education, 2003.
2. SarojKaushik, Artificial Intelligence, CENGAGE Learning,1st Edition, 2011 .

Reference Books:

1. Tom M. Mitchell, Machine Learning, 1st Edition, Tata McGraw-Hill (TMH), 1997.
2. Deepak Khemani, Artificial Intelligence, 1st Edition, Tata McGraw-Hill (TMH), 2013.
3. Peter Harrington, Machine Learning in Action, 1st Edition, Manning Publications / DreamTech Press, 2012.
4. M.N. Murthy, V.S. Ananthanarayana, Machine Learning: Theory and Practice, Universities Press (India), 1st Edition, 2024.