

FOUNDATIONS OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

I Year B. Tech. I Semester
(CSM)

Course Code:

L	T	P	C
3	0	2	4

COURSE OUTCOMES:

- CO1: Describe basic AI concepts and types of intelligent-agents. (L2)
- CO2: Apply uninformed search techniques to solve AI problems. (L3)
- CO3: Make use of informed search strategies to solve AI problems. (L3)
- CO4: Explain basic machine Learning concepts. (L2)
- CO5: Describe various applications of Reinforcement learning and deep Learning. (L2)

UNIT-I:

(10 Lectures)

INTRODUCTION TO ARTIFICIAL INTELLIGENCE:

Introduction, History and Evolution of AI, The architecture of AI Systems, AI development Life Cycle, Domains and Scope of AI Applications, AI Tools and their Applications.

INTELLIGENT AGENTS:

Introduction, Agents and the Environment, Structure of Intelligent Agent-Intelligent Agent Program, Agent Architecture; Types of Agents. (Textbook-1)

Learning Outcomes: At the end of the unit, student will be able to

1. Explain AI evolution, architecture, and applications. (L2)
2. Describe various characteristics of environment. (L2)
3. Illustrate various types of intelligent agents. (L2)

UNIT-II:

(10 Lectures)

STATE SPACE REPRESENTATION:

Key Components of State Representation, State Space Representation Models, Applications of State Space Modeling.

PROBLEM SOLVING:

Problem Solving Agents, Types of Search Algorithms, Uninformed Search Strategies-Breadth First Search, Depth First Search, Depth-Limited Search, Iterative Deepening Depth First Search, Uniform Cost Search, Bi-directional Search. (Textbook-1)

Learning Outcomes: At the end of the unit, student will be able to

1. Explain state-space representations for real world problems. (L2)
2. Describe problem-solving agents. (L2)
3. Apply different uninformed search strategies to solve problems. (L3)

UNIT -III:

(10 Lectures)

INFORMED SEARCH STRATEGIES:

Informed Search Strategies-Generate-and-Test Search, Best First Search, Greedy Best First Search, A* Search, AO* Search, Hill Climbing Search. (Textbook-1)

Learning Outcomes: At the end of the unit, student will be able to

1. Differentiate uninformed and informed search strategies. (L2)
2. Describe the role of heuristic function in informed search strategies. (L2)
4. Apply different informed search strategies to solve problems. (L3)

UNIT-IV:

(10 Lectures)

INTRODUCTION TO MACHINE LEARNING:

Need for Machine Learning, Machine Learning Explained, Machine Learning in relation to other fields, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process, Machine Learning Applications. (Textbook-2)

Learning Outcomes: At the end of the unit, student will be able to

1. Explain the need for ML and its relationship with AI. (L2)
2. Differentiate supervised, unsupervised, and reinforcement learning. (L2)
3. Describe the ML process, challenges, and applications. (L2)

UNIT-V:

(10 Lectures)

REINFORCEMENT LEARNING:

Overview of Reinforcement Learning, Scope of Reinforcement Learning, Components of Reinforcement Learning, Markov Decision Process.

ARTIFICIAL NEURAL NETWORKS:

Introduction, Biological Neurons, Artificial Neurons, Types of Artificial Neural Networks

DEEP LEARNING:

Introduction to Deep Neural Networks, Transfer Learning, Applications of Deep Learning. (Textbook-2)

Learning Outcomes: At the end of the unit, student will be able to

1. Explain RL concepts and Markov Decision Process. (L2)
2. Differentiate biological and artificial neuron. (L2)
3. Explain Deep Learning and Transfer Learning applications. (L2)

TEXT BOOKS:

1. Chandramouli Subramanian and Asha A George, *Artificial Intelligence: Principles and Applications*, Universities Press, 2026
2. S. Sridhar and M. Vijaya Lakshmi, *Machine Learning*. New Delhi, India: Oxford University Press, 2021.

REFERENCE BOOKS:

1. S. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach*, 4th ed. Hoboken, NJ, USA: Pearson, 2021
2. D. L. Poole and A. K. Mackworth, *Artificial Intelligence: Foundations of Computational Agents*, 3rd ed. Cambridge, U.K.: Cambridge University Press, 2023.
3. E. Rich, K. Knight, and S. B. Nair, *Artificial Intelligence*, 3rd ed. New Delhi, India: McGraw Hill Education, 2009
4. K. Uma Rao, *Artificial Intelligence and Neural Networks*. New Delhi, India: Pearson Education, 2011.

WEB REFERENCES:

1. <https://nptel.ac.in/courses/106106226>
2. <https://nptel.ac.in/courses/106106140>

COURSE OUTCOMES:

CO1: Identify and explain intelligent agents, and AI environments. (L2)

CO2: Apply state-space, search, and problem-solving techniques to simple AI problems. (L3)

CO3: Make use of informed search strategies to solve simple AI problems. (L3)

CO4: Use machine learning concepts with no-code AI tools. (L3)

CO5: Demonstrate simple AI applications using neural networks and deep learning tools. (L3)

LIST OF PROGRAMS

(Any Twelve programs should be carried out)

1. Design Intelligent Agents using the PEAS framework.
2. Classify different types of AI environments.
3. Represent AI problems using state-space models.
4. Formulate real-world problems as AI problems.
5. Apply Breadth First Search for route finding.
6. Apply Depth First Search for maze solving.
7. Apply Best First Search for problem solving.
8. Apply Heuristic Search for route finding.
9. Apply Greedy Best-First Search for route finding.
10. Apply A* Search for optimal path finding.
11. Find optimized solution for path finding using Hill Climbing Search.
12. Classify real-world problems into appropriate Machine Learning types.
13. Demonstrate the Machine Learning process using a no-code tool.
14. Implement digit classification using Teachable Machine.
15. Implement fruit classification using Teachable Machine.
16. Implement a simple classification application using an Artificial Neural Network with a no-code tool.

Additional Activities beyond the Curriculum:

Case Studies:

S.No.	Case Study	Activity
1	Smart Campus Navigation	Represent campus locations and find routes using BFS, DFS, Best First, A*, and Hill Climbing.
2	Intelligent Campus Help Agent	Design a simple agent to answer common campus-related queries using the PEAS framework.
3	Waste Classification	Create a model to classify waste into Paper, Plastic, and Metal categories.
4	Hand Gesture Recognition	Create a model to recognize simple hand gestures such as Open Palm, Fist, and Thumbs Up.
5	Simple Image Classification	Create a model to classify common objects such as Book, Bottle, and Mobile Phone using a pre-trained model.

Note: The following tools may be used depending on the program:

1. ChatGPT
2. Perplexity
3. Claude
4. draw.io
5. diagrams.net
6. Teachable Machine

WEB REFERENCES:

1. <https://chatgpt.com/>
2. <https://www.perplexity.ai/>
3. <https://claude.com/>
4. <https://www.drawio.com/>
5. <https://app.diagrams.net/>
6. <https://teachablemachine.withgoogle.com/>