

<b>Devi Ahilya Vishwavidhyalaya, Indore, India Institute of Engineering &amp; Technology</b>				<b>II Year B.Tech. (Computer Science &amp; Engineering)</b>	
<b>Course Code &amp; Name</b>	<b>Instructions Hours per Semester and Credits</b>				
<b>4RCPC2  ARTIFICIAL INTELLIGENCE &amp; MACHINE LEARNING FUNDAMENTALS</b>	<b>Classroom Instruction (CI)</b>	<b>Lab Instruction (LI)</b>	<b>Term Work (TW) and Self Learning (SL)</b>	<b>Total no. of Hours Per semester</b>	<b>Total Credits (Total Hours/30)</b>
	<b>L</b>	<b>T</b>	<b>P</b>	<b>TW+SL</b>	<b>120</b>
	<b>30</b>	<b>10</b>	<b>20</b>	<b>60</b>	

**Course Learning Objectives:**

- Understand the fundamentals of AI and problem-solving techniques.
- Represent knowledge and apply logical reasoning.
- Explain machine learning concepts and algorithm types.
- Implement supervised and unsupervised ML algorithms.
- Analyze and evaluate model performance.
- Understand basics of neural networks and reinforcement learning.

**Prerequisites:**

Basic programming knowledge (Python/C++), Fundamentals of Data Structures and Probability

**COURSE CONTENTS**

**Unit-I**

**Introduction to Artificial Intelligence:** Definition and scope of AI, History & evolution of AI, Applications of AI (Robotics, NLP, Healthcare, Finance, etc.), Intelligent agents: Agent types: Simple reflex, model-based, goal-based, utility-based, Agent architecture, Constraint Satisfaction Problems (CSP) - Basics

**Unit-II**

**Knowledge Representation & Reasoning:** Problem-solving approaches: Search problems, state space, Uninformed search: BFS, DFS, Uniform-cost search, Informed search: Greedy, A\* search, Inference mechanisms: Forward chaining, Backward chaining, Handling uncertainty, Bayesian networks (introduction) Fuzzy logic fundamentals, Introduction to Expert Systems

**Unit-III**

**Introduction to Machine Learning:** What is Machine Learning? ML workflow and applications Types of ML: Supervised learning Unsupervised learning Semi-supervised learning Reinforcement learning, Train, test, validation split Underfitting vs Overfitting Bias–Variance tradeoff, Performance evaluation metrics: Accuracy, Precision, Recall, F1-score Confusion matrix, ROC curve (basic)

**Unit-IV**

**Supervised Learning Algorithms:** Regression: Linear Regression Multiple Linear Regression Logistic Regression, Classification algorithms: k-Nearest Neighbors (kNN) Decision Trees, Random Forest, Support Vector Machines (SVM) – basics Naïve Bayes classifier, Feature engineering and feature selection

## Unit-V

**Unsupervised Learning & Neural Networks:** Clustering: K-means, Hierarchical clustering, Dimensionality Reduction: PCA, t-SNE Introduction to Neural Networks: Perceptron model Activation functions, Concept of forward propagation Introduction to Deep Learning: ANN basics, Overview of CNN & RNN (conceptual only), Agent–Environment interaction: Rewards & policies, Markov Decision Process (MDP) — intro Q-Learning basics.

### Course Outcomes:

- CO1: Understand fundamentals of AI, agents, applications, and CSP basics.
- CO2: Apply search, knowledge representation, and reasoning techniques.
- CO3: Explain machine learning concepts and model evaluation methods.
- CO4: Implement supervised learning algorithms for prediction and classification.
- CO5: Apply unsupervised learning, neural networks, and reinforcement learning basics.

### CO-PO-PSO Relationship

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PS O2	PS O3
CO1	3	2	1	–	1	–	–	–	–	–	–	1	2	3
CO2	3	3	2	2	1	–	–	–	–	–	–	1	3	3
CO3	3	2	2	2	2	–	–	–	–	–	–	-	2	3
CO4	3	3	3	2	3	–	–	–	–	–	–	2	3	3
CO5	3	3	2	2	3	–	–	–	–	–	–	1	2	3

### Books Recommended:

1. **Stuart Russell & Peter Norvig** – *Artificial Intelligence: A Modern Approach*
2. **Tom Mitchell** – *Machine Learning*
3. **Ethem Alpaydin**, *Introduction to Machine Learning*, MIT Press.
4. **Aurélien Géron** – *Hands-On Machine Learning with Scikit-Learn & TensorFlow*