

25MCST301	INTRODUCTION TO ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	Category	L	T	P	R	Credit	Year of Introduction
		VAC	4	0	0	0	4	2025

Preamble: This course introduces the fundamental concepts and techniques of Artificial Intelligence and Machine Learning. It focuses on intelligent agents, problem-solving methods, search strategies, and machine learning approaches used to build intelligent systems. Students will learn to apply various AI techniques such as uninformed and informed search, adversarial search, supervised learning models, and unsupervised learning methods. The course enables students to understand AI principles and apply appropriate algorithms to interpret data and solve real-world problems using intelligent systems.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Explain the fundamental concepts of Artificial Intelligence, intelligent agents, rationality, and problem-solving frameworks	K2 Understand
CO2	Apply uninformed and informed search techniques to solve AI problems.	K3 Apply
CO3	Apply supervised learning techniques to design and train classification and regression models using appropriate features.	K3 Apply
CO4	Apply machine learning techniques including clustering, dimensionality reduction, ensemble methods, and resampling methods in machine learning problems.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	1	2	2
CO2	3	3	2	1	2	-	-	-	-	-	1	3	2
CO3	3	3	2	2	3	-	-	-	-	-	2	3	2
CO4	3	3	2	2	2	-	-	-	-	-	2	2	2
Avg	3	2.75	2	1.6	2.3	-	-	-	-	-	1.3	2.5	2

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
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CO1	*	*	*	*				*	
CO2	*	*	*	*	*	*		*	
CO3	*	*	*	*	*	*		*	
CO4	*	*	*	*	*	*		*	

Wks Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*		*	

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5hrs

Continuous Internal Evaluation Pattern:

Attendance	: 5 marks
Continuous Assessment Test	: 20 marks
Continuous Assessment Assignment	: 15 marks

SYLLABUS

Module 1 (11 Hours)

Introduction to Artificial Intelligence: Definition, History of AI, Intelligent agents: Agents and environments, Structure of Agents, Concept of rationality. Problem-solving agents and example problems.

Module 2 (15 Hours)

Search strategies: Uninformed search and informed search strategies. Adversarial search: Games, optimal decisions in games, Minimax algorithm, Alpha-Beta pruning, and real-world applications.

Module 3 (15 hrs)

Machine Learning vs. Traditional Programming, Machine learning paradigms - supervised, semi-supervised, unsupervised, reinforcement learning.

Supervised learning: Regression - Linear regression with one variable, Linear regression with multiple variables. Classification - Logistic regression, Naive Bayes, KNN.

Module 4 (15 hrs)

Unsupervised Learning: Clustering, Similarity measures, Hierarchical Clustering - Agglomerative Clustering, K-means clustering, Dimensionality reduction - Principal Component Analysis. Ensemble methods - bagging, boosting. Resampling methods - Bootstrapping, Cross Validation.

Text Books

1. Russell, S., & Norvig, P. (2020). *Artificial intelligence: A modern approach* (4th ed.). Pearson.
2. Rich, E., & Knight, K. (2009). *Artificial intelligence* (3rd ed.). Tata McGraw-Hill.
3. Alpaydin, E. (2020). *Introduction to Machine learning* (4th ed.). MIT Press.

Reference Books

1. Mitchell, T. M. (1997). *Machine learning*. McGraw-Hill.
2. Murphy, K. P. (2023). *Probabilistic machine learning: Advanced topics*. MIT Press.
3. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning*. MIT Press.

END SEMESTER EXAMINATION – MODEL QUESTION PAPER

Course Code	25MCST301
Course Name	INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Max. Marks: 60	Duration: 2.5 Hours

Part A <i>(Answer all questions. Each question carries 3 marks)</i>				
Qn No.	Question	Marks	CO	BL
1	Explain problem-solving agents with a suitable example.	3	1	L2
2	Differentiate simple reflex agents and rational agents.	3	1	L2
3	Explain the role of Alpha-Beta pruning in reducing the search space of a game tree.	3	2	L2
4	Differentiate uninformed search and informed search strategies.	3	2	L2
5	Differentiate machine learning and traditional programming.	3	3	L2
6	A self-driving car learns to navigate traffic signals and avoid obstacles by receiving rewards for safe actions and penalties for collisions. Apply Reinforcement Learning to improve the driving decisions of the system.	3	3	L3
7	A mobile service provider has collected customer usage data such as call duration, internet usage, and recharge amount. Apply K-Means Clustering to group customers with similar usage patterns.	3	4	L3
8	Explain bagging and boosting.	3	4	L2
Part B <i>(Answer any one full question from each Module. Each carry 9 marks)</i>				

Module I				
Qn No.	Question	Marks	CO	BL
9.a	Explain the concept of intelligent agents and describe their basic structure with a neat diagram.	5	1	L2
9.b	Explain the concept of rationality in Artificial Intelligence with a suitable example.	4	1	L2
OR				
10.a	Explain the history and evolution of Artificial Intelligence with suitable examples.	5	1	L2
10.b	Explain problem formulation in Artificial Intelligence with suitable examples.	4	1	L2
Module II				
Qn No.	Question	Marks	CO	BL
11.a	Explain Breadth First Search (BFS) and Depth First Search (DFS) with suitable examples.	5	2	L2
11.b	A rescue drone must locate the nearest safe exit in a disaster-affected building represented as a graph of connected rooms. Apply Breadth First Search to find the optimal escape path.	4	2	L3
OR				
12.a	Explain informed search strategies and heuristic functions with a suitable example.	5	2	L2
12.b	A game AI character must move through a map containing obstacles to reach a treasure location using estimated path cost. Apply a Heuristic Search technique to determine the best route.	4	2	L3
Module III				
Qn No.	Question	Marks	CO	BL
13.a	A delivery company wants to estimate delivery time based on distance, traffic density, and vehicle speed data. Apply Linear Regression to predict the delivery time for new orders.	5	3	L3
13.b	A university wants to predict whether a student will pass or fail an examination using attendance percentage, assignment scores, and internal marks. Apply Logistic Regression to classify student performance.	4	3	L3
OR				
14.a	A bank wants to detect fraudulent transactions based on transaction amount, location, account activity, and device information. Implement a Naive Bayes Classifier to classify transactions as "Fraudulent" or "Legitimate".	5	3	L3
14.b	Illustrate supervised, semi-supervised, unsupervised, and reinforcement learning paradigms with suitable real-world examples.	4	3	L3
Module IV				
Qn No.	Question	Marks	CO	BL
15.a	A weather monitoring department wants to group regions based on temperature, humidity, and rainfall patterns for climate analysis. Apply K-Means Clustering to group the	5	4	L3

	regions into suitable clusters.			
15.b	Explain Principal Component Analysis (PCA) and its significance in dimensionality reduction.	4	4	L2
OR				
16.a	A hospital aims to improve disease prediction accuracy using patient records such as age, blood pressure, cholesterol level, and glucose level. Apply bagging and boosting methods to improve the classification performance.	5	4	L3
16.b	Explain bootstrapping and cross-validation with suitable examples.	4	4	L2

