

Artificial Intelligence and Machine Learning

Course Code: **MCA-203****L T C**Course Name: **Artificial Intelligence and Machine Learning****3 1 4****INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:-

1. AI principles and approaches.
2. Develop basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic and learning.
3. Understanding nature of problems solved with ML.

PRE-REQUISITES:

1. Basic knowledge of Mathematical Logic
2. Linear algebra

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the CO	BT Level	Mapping to PO #
CO1	Define the meaning of Intelligence and recall various models for knowledge representation and reasoning within an AI problem domain.	BTL1	PO1, PO2
CO2	Summarize varied learning algorithms and model selection.	BTL2	PO1, PO2, PO3
CO3	Apply the concept of learning trends and patterns from data to build an appreciation for what is involved in learning from data.	BTL3	PO1, PO2, PO3, PO4, PO5
CO4	Analyze and apply a variety of learning algorithms to data.	BTL4	PO1, PO2, PO3, PO4, PO5, PO6, PO10
CO5	Appraise AI algorithms and assess their performance. Follow standards and ethical practices.	BTL4	PO1, PO2, PO3, PO4, PO5, PO6, PO10
CO6	Develop a strong foundation for a wide variety of	BTL6	PO1, PO2, PO3,

	state of the art Machine Learning algorithms.		PO4, PO5, PO6, PO7, PO9, PO10, PO11, PO12
--	---	--	---

UNIT – I**No. of Hours: 10****Chapter / Book Reference: TB1 [Chapters 1-6]**

AI Fundamentals: Defining Artificial Intelligence, Types of AI, Turing test, Defining AI techniques, Comparison - AI, ML and Deep Learning, Problem characterization and reduction, Defining State Space and AI Search Techniques (Hill Climbing, Breadth first and depth first search, Best first search, A*, AO*, Constraint Satisfaction), MEA, Ethics of AI.

UNIT – II**No. of Hours: 10****Chapter / Book Reference: TB1 [Chapters 7- 9, 12-14]**

Knowledge Representation and Reasoning: Approaches to knowledge representation: Propositional Logic, First Order Predicate Logic, Inference Rules (Modus Ponens, Modus Tollens, Resolution, And elimination, Syllogism), Production Rules, Types of knowledge, Reasoning: Forward and backward reasoning, Non-monotonic Reasoning, Reasoning with uncertainties.

UNIT – III**No. of Hours: 10****Chapter / Book Reference: TB1 [Chapter 18]; TB2 [Chapters 2-5]**

Machine Learning: Introduction to Machine Learning, Why Machine learning, Types of Machine Learning Problems, Applications of machine learning. Supervised machine Learning – Regression and Classification. Regression- Simple, Multiple Regression, Least Squares, Total sum of squares, Sum of Square of Residuals, Sum of square of Regression, odds, odds ratio. Classification: Logistic Regression, Accuracy methods: coefficient of determination, correlation, confusion matrix, Overfitting and underfitting, Bias and variance. Accuracy methods: coefficient of determination, correlation, confusion matrix.

UNIT – IV**No. of Hours: 10****Chapter / Book Reference: TB1 [Chapter 18];
TB2 [Chapters 10,14, 16]; TB3 [Chapters 6, 10]**

Unsupervised Learning: Dimensionality reduction (Principal component analysis), K-means clustering, Ensemble Learning (Boosting and Bagging). Neural Networks, Types of Neural networks, Activation functions, Feed forward, Back Propagation Algorithm, Recommender Systems, Content based recommendations.

TEXT BOOKS:

- TB1. Stuart Russel, and Peter Norvig, “Artificial intelligence: A Modern Approach”, Pearson Education Limited, 4th Edition, 2020.
- TB2. T. Hastie, R. Tibshirani and J. Friedman, “The Elements of Statistical Learning: Data Mining, Inference, and Prediction”, Springer, 2nd Edition, 2017.
- TB3. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, Wiley, 2nd Edition, 2012.

REFERENCE BOOKS:

- RB1. E. Rich, K. Knight. S. B. Nair, “Artificial Intelligence”, McGraw-Hill Publishing Company