

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication Engg.)			
Subject Code & Name	Instructions Hours per Week			Credits			
6ETRE1 AI AND MACHINE LEARNING	L	T	P	L	T	P	Total
Duration of Theory Paper: 3 Hours	3	1	2	3	1	1	5

Course Learning Objective:

The course is designed

1. To introduce the objectives, components, applications and current trends of Artificial Intelligence.
2. To learn about in intelligent agents, problem solving methods and knowledge & reasoning
3. To understand statistics and probability theory to develop a predictive model.
4. To impart knowledge of developing unsupervised and supervised learning models.
5. To introduce Python programming for AI algorithms and Machine Learning modules.

Prerequisite: Basic Mathematics and Programming

COURSE CONTENTS

Unit I

Introduction to artificial intelligence, objectives of AI, foundations of AI, categories of AI, components of AI, sub domains of artificial intelligence, applications of AI, current trends in artificial intelligence, Intelligent agents and environment: intelligent agents, concept of rationality, PEAS description of agents, types of environments, structure of intelligent agents: simple reflex agents, model-based reflex agents, goal-based agents and utility-based agents learning agents.

Unit II

Problem solving methods, search strategies, uninformed search strategies: breadth first search, depth first search, depth limited search, iterative deepening depth first search, uniform cost search, bidirectional search, informed search strategies, heuristics functions, greedy best first search, A* search, Local Search Algorithms and Optimization Problems, Backtracking Search, Game Playing, Optimal Decisions in Games, Alpha, Beta Pruning. Knowledge representation & Reasoning. Implementation of AI algorithms using Python programming.

Unit III

Understanding Data: Data collection Data Preprocessing, Data transformation, Min Max procedure and z-Score, Descriptive statistics: Data types, univariate data analysis and visualization, Bivariate and multivariate statistics, Machine learning and probability of statistics, Bayes rule, Bayesian networks, hypothesis, hypothesis testing, basics of learning theory, Concept learning, representation of hypothesis, hypothesis space, hypothesis space searching algorithm. Induction biases, Implementation of statistical modules, data preprocessing and hypothesis space searching algorithm using Python programming.

Unit IV

Aspects of developing a learning system: Training Data, Validation Data and Test data, Forms of learning, supervised learning, classification and regression learning methods: KNN algorithm, decision tree classifier, support vector machines, Naive Bayes classifier algorithm, linear regression, logistic regression, random forest regression and classifier, Confusion matrix. Implementation of Machine Learning modules using Python programming.

Unit V

Unsupervised Learning, clustering and Association, K-means clustering algorithm, hierarchical clustering, Anomaly detection, Ensemble learning, Reinforcement learning, Artificial Neural Networks. Introduction to Deep learning, Implementation of Machine Learning modules using Python programming.

Course Outcome:

Students earned credits will develop ability to

CO. No.	CO	PO
CO1	Ability to develop a basic understanding of Artificial Intelligence, intelligent system, AI building blocks and AI applications.	PO-1
CO2	Apply problem solving methods to understand, analyse & resolve the complex problems.	PO-1, PO-2, PO-3, PO-4
CO3	Develop a predictive model for decision-making under uncertainty.	PO-3, PO-5
CO4	Apply learning algorithms to design classification and regression model.	PO-3, PO-4, PO-5, PO-6, PO-9

CO5	Design AI algorithms and Machine Learning modules using python programming.	PO-2, PO-3, PO-4, PO-5, PO-6, PO-9
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CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	2											
CO2	2	3	2	3								
CO3			3		3							
CO4			3	3	3	3			2			
CO5		3	3	3	3	3			2			

BOOKS RECOMMENDED:

- [1]. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 3rd Edition, 2009
- [2]. Kevin Night and Elaine Rich, Nair B., Artificial Intelligence (SIE), Mc Graw Hill, 2008.
- [3]. David L. Poole, Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
- [4]. Mitchell Tom M., Machine Learning, Mc Graw Hill Education (India) Edition 2013.
- [5]. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009
- [6]. Michael Bowles, Machine Learning in Python, John Wiley & Sons, Inc., 2015

List of Practical Assignments: (Python programs)

1. Write a program to implement Tic-Tac-Toe game problem.
2. Write a program to implement informed search
3. Write a program to implement uninformed search
4. Write a program to implement Find-S algorithm
5. Implement various data preprocessing techniques for given data sets.
6. Develop Regression based ML model for given data sets.

7. Implement a classification-based ML algorithm.
8. Design a clustering-based algorithm.
9. Develop an application using any machine learning algorithm.
10. Case Studies on different data sets