1st Semester

24PC1009 ARTIFICIAL INTELLIGENCE (3-0-0)

Objectives:
The primary objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence, emphasizing on the teaching of these fundamentals, instead of providing an expertise of specific software tools or programming environments.
The focus on the course is-

- To become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- To Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- To Explore the current scope, potential, limitations, and implications of intelligent systems.

Module-I (12 hours)
INTRODUCTION –The Foundations of Artificial Intelligence; - INTELLIGENT AGENTS – Agents and Environments, Good Behaviour: The Concept of Rationality, the Nature of Environments, the Structure of Agents, SOLVING PROBLEMS BY SEARCH – Problem-Solving Agents, Formulating problems, Searching for Solutions, Uninformed Search Strategies, Breadth-first search, Depth-first search, Searching with Partial Information, Informed (Heuristic) Search Strategies, Greedy best-first search, A* Search, CSP, Means-End-Analysis.

Module-II (12 hours)
ADVERSARIAL SEARCH – Games, The Mini-Max algorithm, optimal decisions in multiplayer games, Alpha-Beta Pruning, Evaluation functions, Cutting off search, LOGICAL AGENTS – Knowledge-Based agents, Logic, Propositional Logic, Reasoning Patterns in Propositional Logic, Resolution, Forward and Backward chaining - FIRST ORDER LOGIC – Syntax and Semantics of First-Order Logic, Using First-Order Logic , Knowledge Engineering in First-Order Logic - INFERENCE IN FIRST ORDER LOGIC – Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution

Module-III (6 hours)
UNCERTAINTY – Acting under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions, Independence, Bayes' Rule and its Use, PROBABILISTIC REASONING – Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distribution, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks

Module-IV (10 hours)
LEARNING – Learning from Examples: SupervisedLearning , LearningDecisionTrees, Regression and Classification with Linear Models, ion with Linear Models, ArtificialNeuralNetworks, SupportVectorMachines, EnsembleLearning, Learning Probabilistic Models: StatisticalLearning, Reinforcement Learning: PassiveReinforcementLearning, ActiveReinforcementLearning, Natural Language Processing, LanguageModels, TextClassification, InformationRetrieval, InformationExtraction.

Outcomes:
Upon successful completion of this course, the student shall be able to:
- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.
- Demonstrate proficiency in applying scientific method to models of machine learning.

- Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications

Books:

1. Stuart Russell, Peter Norvig, Artificial Intelligence -A Modern Approach, 4/e, Pearson
2. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill,3rd ed
3. Nils J Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publications,
4. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.