Course: Elective
Advanced Artificial Intelligence

Semester: I	**Credits:4**	**Subject Code:SMAJEAAI123556**	**Lectures: 60**

Course Outcomes:

At the end of this course, the learner will be able to:

- CO1- Understand the informed and uninformed problem types and apply search strategies to solve them.
- CO2- Differentiate between biological neuron, artificial neuron, the application areas of neural networks, and building blocks of Neural Networks
- CO3-Apply difficult real-life problems in a state space representation to solve them using AI techniques like searching and game playing
- CO4- Formulate valid solutions for problems involving uncertain inputs or outcomes by using decision making techniques
- CO5- Categorize the machine learning algorithms as supervised learning and unsupervised learning and apply and analyze the various algorithms of supervised and unsupervised learning
- CO6-Demonstrate and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area.

Unit 1:Introduction to Artificial Intelligence and searching algorithm

15

- Introduction to Artificial Intelligence-Introduction and Intelligent systems, What Is AI?,The Foundations of Artificial Intelligence , The History of Artificial Intelligence, Applications of AI, Early work in AI and related fields, AI problems and Techniques.
- Searching-Defining AI problems as a State Space Search(Search and Control Strategies, Problem Characteristics,Issues in Design of Search Programs, Production System),Blind Search Techniques-(BFS, DFS, DLS, Iterative Deepening Search, Bidirectional Search, Uninformed cost Search),Heuristic search techniques: Generate and test ,Hill Climbing,Best First search ,Constraint Satisfaction ,Mean-End Analysis,A*,AO*

Unit 2:Knowledge Representation

15

- Knowledge Representation-Representations and Mappings, Approaches to Knowledge Representation, Knowledge representation method,Propositional Logic, Predicate logic, Representing Simple facts in Logic, Resolution,Forward and backward chaining
- Knowledge Representation Structure-Weak Structures, Strong Structures, Semantic Networks, Frames, Conceptual Dependencies, Scripts.

Unit 3: Game playing and machine learning

15

- Game Playing-Minimax Search Procedures, Adding alpha-beta cutoffs,
- Machine Learning-Why Machine learning,Types of Machine Learning: Supervised learning- Classification & Regression-Decision tree,Random Forest,KNN, Logistic

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algorithms, Unsupervised learning-Clustering & Association-K-means for clustering , Apriori algorithm. Support Vector Machine (SVM), Reinforcement learning.

Unit 4: Artificial Neural Networks **15**

- Artificial Neural Networks (ANN)
- Biological neuron structure and functions
- Structure and functions of Artificial Neuron.
- Difference between biological and Artificial Neural Network
- Artificial neural network terminologies
- The basic building blocks of Artificial Neural Network-
- Network Topology - Feed forward Network,Single layer feed forward network,Multilayer feed forward network
- Feedback Network-Recurrent networks,recurrent network,Jordan network
- Adjustments of Weights or Learning-Supervised Learning,Unsupervised Learning,Reinforcement Learning
- Activation Functions-Binary sigmoidal function,Bipolar,sigmoidal function
- Applications of ANN, Advantages and Limitation
- Self-Organising Systems-Unsupervised Learning,Kohonen's self-organizing map
- Feedback neural networks-Hopfield model,Boltzmann machine

Reference Books:

- Eberhart, *Computational Intelligence*, Elsevier Publication
- Ethem Alpaydin, *Introduction to Machine Learning*,PHI 2nd Edition
- Nilsson,*Artificial Intelligence: A New Synthesis*, Elsevier Publication
- Prateek Joshi,*Artificial Intelligence with Python*, Packt Publishing Ltd
- Satish Kumar, *Neural Networks – A Classroom Approach*, Tata McGraw-Hill

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Faculty	Mrs. Shubhangi Jagtap	Shubhangi 15/7/23
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Faculty	Mrs. Anjali Kale	15/7/23
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Subject Expert (Outside SPPU)	Dr. Manisha Divate	Divate 15/7/23
VC Nominee (SPPU)	Dr. Reena Bharathi	15/7/23
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