

## **CS6361**

### **ARTIFICIAL INTELLIGENCE (3-0-0)**

#### **Syllabus:**

INTRODUCTION – Agents and Objects – Evaluation of Agents – Agent Design Philosophies - Multi-agent System – Mobile Agents – Agent Communication – Knowledge query and Manipulation Language – Case Study. What is AI?, The Foundations of Artificial Intelligence; - INTELLIGENT AGENTS – Agents and Environments, Good Behavior: 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: Minimizing the total estimated solution cost, Heuristic Functions, Local Search Algorithms and Optimization Problems, Online Search Agents and Unknown Environments; –ADVERSARIAL SEARCH – Games, The minimax algorithm, Optimal decisions in multiplayer games, Alpha-Beta Pruning, Evaluation functions, Cutting off search, Games that Include an Element of Chance; - LOGICAL AGENTS – Knowledge-Based agents, The Wumpus World, Logic, Propositional Logic: A Very Simple Logic, Reasoning Patterns in Propositional Logic, Resolution, Forward and Backward chaining; - FIRST ORDER LOGIC – Syntax and Semantics of First-Order Logic, Master of Computer Applications 18 Using First-Order Logic , Knowledge Engineering in First-Order Logic; - INFERENCE IN FIRST ORDER LOGIC – Propositional vs. FirstOrder Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution ; - UNCERTAINTY – Acting under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions, Independence, Bayes’ Rule and its Use, The Wumpus World Revisited; - 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; - STATISTICAL LEARNING METHODS – Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: EM Algorithm.

#### **Reading:**

1. Stuart Russell, Peter Norvig, Artificial Intelligence -A Modern Approach, 3/e, Pearson, 2003.
2. Nils J Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann publications, 2000.

#### **Course Plan**

Lecture 1. INTRODUCTION of AI

Lecture 2. Agents and Objects – Evaluation of Agents –

Lecture 3. Agent Design Philosophies – Multi-agent System –

Lecture 4. Mobile Agents – Agent Communication –

Lecture 5. Knowledge query and Manipulation Language – Case Study.

Lecture 5. What is AI?, The Foundations of Artificial Intelligence; -

Lecture 7. INTELLIGENT AGENTS – Agents and Environments,

Lecture 8. Good Behavior, The Concept of Rationality,

Lecture 9. The Nature of Environments, The Structure of Agents;

Lecture 10. - SOLVING PROBLEMS BY SEARCH – Problem-Solving Agents,

Lecture 11. Formulating problems, Searching for Solutions,

Lecture 12. Uninformed Search Strategies, Breadth-first search, Depth-first search,

Lecture 13. Searching with Partial Information,

Lecture 14. Informed (Heuristic) Search Strategies, Greedy best-first search, A\* Search:

Lecture 15. Minimizing the total estimated solution cost, Heuristic Functions,

Lecture 16. Local Search Algorithms and Optimization Problems,

Lecture 17. Online Search Agents and Unknown Environments; –

Lecture 18. ADVERSARIAL SEARCH – Games, The minimax algorithm,

Lecture 19. Optimal decisions in multiplayer games,

Lecture 20. Alpha-Beta Pruning, Evaluation functions, Cutting off search,

Lecture 21. Games that Include an Element of Chance; -

Lecture 22. LOGICAL AGENTS – Knowledge-Based agents, The Wumpus World, Logic,

Lecture 23. Propositional Logic: A Very Simple Logic, Reasoning Patterns in Propositional Logic, Resolution,

Lecture 24. Forward and Backward chaining; -

Lecture 25. FIRST ORDER LOGIC – Syntax and Semantics of First-Order Logic,

Lecture 26. Using First-Order Logic , Knowledge Engineering in First-Order Logic; -

Lecture 27. INFERENCE IN FIRST ORDER LOGIC –

Lecture 28. Propositional vs. First Order Inference, Unification and Lifting,

Lecture 29. Forward Chaining, Backward Chaining, Resolution ; -

Lecture 30. UNCERTAINTY – Acting under Uncertainty,

Lecture 31. Basic Probability Notation, The Axioms of Probability,

Lecture 32. Inference Using Full Joint Distributions, Independence,

Lecture 33. Bayes' Rule and its Use, The Wumpus World Revisited; -

Lecture 34. PROBABILISTIC REASONING – Representing Knowledge in an Uncertain Domain,

Lecture 35. The Semantics of Bayesian Networks, Efficient Representation of Conditional Distribution,

Lecture 36. Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks; -

Lecture 37. STATISTICAL LEARNING METHODS – Statistical Learning,

Lecture 38. Learning with Complete Data, Learning with Hidden Variables: EM Algorithm.