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Course Code: INT314

ARTIFICIAL INTELLIGENCE & LOGICAL REASONING

Course Objectives
This course helps the learner to understand the basic knowledge representation, problem solving and logical reasoning. It also helps the learner to understand various methods of solving problems using artificial intelligence.

UNIT - I   11 Periods

Introduction: Problems of AI - AI technique - Tic-Tac-Toe problem - Intelligent Agents: Agents & environment - nature of environment - structure of agents - goal based agents - utility based agents - learning agents. **Problem Solving, Problems, Problem Space & search:** Defining the problem as state space search - production system - problem characteristics - issues in the design of search programs. **Search techniques:** Problem solving agents - searching for solutions - uniform search strategies- breadth first search - depth first search - depth limited search - iterative deepening - bidirectional search - comparing uniform search strategies.

UNIT - II   11 Periods

Heuristic search strategies: Greedy best-first search - A* search - AO* search - memory bounded heuristic search. local search algorithms & optimization problems: Hill climbing search - simulated annealing search - local beam search. **Constraint satisfaction problems:** Local search for constraint satisfaction problems. **Adversarial search**: Games, optimal decisions & strategies in games - the minimax search procedure - alpha-beta pruning

UNIT - III   11 Periods

Knowledge & reasoning: Knowledge representation issues - representation & mapping - approaches to knowledge representation. Inferences in predicate logic - representing simple fact in logic: propositional Vs Predicate inference - resolution - natural deduction - representing instant & ISA relationship - computable functions & predicates -. Representing knowledge using rules - Procedural verses declarative knowledge - logic programming - forward verses backward reasoning - matching - control knowledge.

UNIT - IV   12 Periods

Probabilistic reasoning: Representing knowledge in an uncertain domain - the semantics of Bayesian networks - Dempster-Shafer theory - Planning Overview - components of a planning system - Goal stack planning - Hierarchical planning - other planning techniques. **Expert Systems:** Representing and using domain knowledge - expert system shells - and knowledge acquisition.

TEXTBOOKS

1. Stuart Russell and Peter Norvig. *Artificial Intelligence - A Modern Approach*. Pearson Education / Prentice Hall of India, Third Edition, 2014.
2. Elaine Rich and Kevin Knight. *Artificial Intelligence*, Tata McGraw-Hill, New Delhi, Third Edition, 2008.

REFERENCES

1. Dan.W.Patterson, *Introduction to Artificial Intelligence & Expert Systems*, Pearson Education India, First Edition, 2015.
2. Saroj Kaushik, *Logic & Prolog Programming*, New Age International, First Edition,2002.
3. Joseph Giarratano and Gary Riley, *Expert Systems,* PWS Publishing, Boston, Third Edition, 1998.

ONLINE MATERIALS

1. NPTEL- https://nptel.ac.in/courses/106105077/
2. MIT Courseware - https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/

UNITWISE LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	• Classify categories of agents based on their relationship with the environment • Solve problems involving uninformed environment during searching solutions
Unit II	• Choose an appropriate informed searching technique for the given problem • Determine the optimal search technique for the given constraint to solve the problem
Unit III	• Represent and use knowledge and logic in various ontological problems • Judge, which representation is suitable under which circumstance
Unit IV	• Understand the ways and means to probabilistic reasoning • Explain the nature and application areas of expert system tools

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the learner will be able to
- Classify intelligent agents based on their relationship with the environment
- Choose an appropriate search strategy for problem solving
- Choose appropriate ontology and logic for knowledge representation and inference
- Discuss the various expert systems attributes and tool of real world problems