Professional Elective - AI and DS Stream

25CSA363A   **Introduction to Artificial Intelligence**   **2 0 2-3**

Course Description

The main objective of this course is to familiarize the students with how to represent knowledge, including incomplete and uncertain knowledge of the real world; how to reason logically with that knowledge using probabilities; how to use these reasoning models and methods to decide what to do, particularly by constructing plans; and how to reason and make decisions in the presence of uncertainty about the world. It includes some state-of-the-art topics, such as the logical representation of different types of knowledge, reasoning under uncertainty.

Course Outcomes:

COs	Description
CO1	Explain the fundamentals of Artificial Intelligence, its problems, problem-solving approaches, and search strategies.
CO2	Apply heuristic search techniques and knowledge representation methods, including predicate logic and frames, to model AI problems.
CO3	Differentiate between procedural and declarative knowledge, and implement reasoning techniques under uncertainty, including probabilistic and fuzzy logic approaches.
CO4	Develop AI solutions for strategic decision-making using game-playing algorithms, including minimax and alpha-beta pruning, and analyze challenges in machine understanding.
CO5	Understand and explain the structure and components of expert systems, knowledge acquisition, and apply common-sense reasoning to solve real-world domain-specific problems.

CO-PO Mapping

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO2
CO1	3	2	–	1	–	–	–	–	–	–	1	2
CO2	3	3	2	2	2	–	–	–	–	–	2	2
CO3	2	3	2	2	2	1	2	–	–	–	3	2
CO4	3	3	3	3	2	1	–	1	–	2	3	2
CO5	2	2	3	2	1	1	2	1	1	2	3	2

3-strong, 2-moderate, 1-weak

Syllabus:

Unit I

What is Artificial Intelligence? – The AI Problems – The Underlying Assumption – What is an AI technique – Criteria for Success. Problems, Problem Spaces and Search – Defining Problem as a State Space Search – Production Systems – Problem Characteristics – Production System Characteristics – Issues in the design of Search Programs.

Unit II

Heuristic Search Techniques - Generate – and – Test – Hill Climbing – Best-First Search – Problem Reduction – Constraint Satisfaction - Means - Ends Analysis. Knowledge Representation issues – Representations and Mapping - Approaches to knowledge Representation – Issues in knowledge Representation – The Frame Problem. Using Predicate Logic – Representing simple facts in Logic – Representing Instance and Isa Relationship – Computable Functions and Predicates – Resolution – Natural Deduction.

Unit III

Representing Knowledge Using Rules – Procedural versus Declarative knowledge – Logic Programming – Forward versus Backward Reasoning – Matching – Control Knowledge. Symbolic Reasoning under Uncertainty – Introduction to Non-monotonic Reasoning – Augmenting a Problem Solver – Implementation: Depth - First Search.

Statistical Reasoning – Probability and Baye' s Theorem – Bayesian Networks – Fuzzy Logic

Unit IV

Game Playing - The Minimax Search Procedure – Adding Alpha-Beta Cutoffs. Understanding – What is Understanding? What makes Understanding hard?

Unit V

Common Sense– Qualitative Physics–Common sense ontology–Memory Organization-Expert Systems–Representing and Using Domain knowledge –Expert System Shells –knowledge Acquisition-Components of an AI program.

TEXTBOOKS:

1. Artificial Intelligence (Second Edition) –Elaine Rich, Kevin knight (Tata McGraw-Hill)
2. A Guide to Expert Systems–Donald A. Waterman (Addison-Wesley)
3. Artificial Intelligence: A Modern Approach- Stuart Russell & Peter Norvig, Pearson, Edition: 2021
4. Introduction to Artificial Intelligence-Wolfgang Ertel, Springer, Edition: 2017

REFERENCES:

1. Principles of Artificial Intelligence, Nils J. Nilsson (Narosa Publishing House)

2. Introduction to Artificial Intelligence, Eugene Char naik, Drew McDermott (Pearson Education Asia)