Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Third Year Bachelor of Engineering (CE/IT)

(In Effect From Academic Year 2019-20)

Subject Code: CT601-N	**Subject Title:** Artificial Intelligence
Pre-requisite	

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
03	00	02	05	4	3	70	30	20	30	150

Learning Objectives:

The search and problem solving methods are applicable throughout a large range of industrial, civil, medical, financial, robotic, and information systems. We will investigate questions about AI systems such as: how to represent knowledge, how to effectively generate appropriate sequences of actions and how to search among alternatives to find optimal or near-optimal solutions.

By the end of the course, students should be able to:

Identify the type of an AI problem (search, inference, decision making under uncertainty, game theory, etc). Formulate the problem as a particular type. Compare the difficulty of different versions of AI problems, in terms of computational complexity and the efficiency of existing algorithms. Implement, evaluate, and compare the performance of various AI algorithms, including both empirical demonstration and theoretical proofs.

Outline of the Course:

Sr. No	Title of the Unit	Minimum Hour
1	Introduction	3
2	Intelligent Agents	3
3	Problem Spaces and Search	8
4	Adversarial search and Game Playing	5
5	Knowledge and Reasoning	12
6	Knowledge Engineering	3
7	Introduction to PROLOG	7
8	Uncertain knowledge and reasoning	7

Total hours (Theory): 48
Total hours (Lab): 32
Total hours: 80

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Detailed Syllabus

Sr. No	Topic	Lecture Hours	Weightage(%)
1	**Introduction** The AI problems, Why do we need to study AI. AI technique Applications of AI, The Underlying Assumption.	3	6
2	**Intelligent Agents** PEAS Representation for an Agent, Agent Environments, Concept of Rational Agent, Structure of Intelligent agents, Types of Agents.	3	6
3	**Problem Spaces and Search** State space search, Uninformed - DFS, BFS, Iterative Deepening and informed search techniques: heuristic Functions, Generate and Test Hill Climbing, Problem Reduction ,Constraint Satisfaction ,Mean-Ends Analysis ,Simulated Annealing, A*, variations of A*.	8	17
4	**Adversarial Search and Game Playing** Games, Minimax algorithm, alpha-beta pruning, Constraint-satisfaction problems.	5	10
5	**Knowledge and Reasoning** Knowledge Based Agent, Introduction To Logic, Propositional Logic, Reasoning in Propositional logic, First Order Logic: Syntax and Semantics, Inference in First Order Logic, Unification, Forward and backward chaining, Resolution.	12	25
6	**Knowledge Engineering** Frames, Ontology, Categories and Objects, Mental Events and Objects. Semantic web and RDF.	3	6
7	**Introduction to PROLOG** Syntax of Prolog ,Facts and predicates, data types, goal finding, backtracking, simple object, compound objects, use of cut and fail predicates, recursion, lists, simple input/output, implementing AI problem in Prolog, dynamic database.	7	15
8	**Uncertain knowledge and reasoning** Uncertainty, Representing knowledge in an Uncertain Domain, Overview of Probability Concepts , Belief Networks, Simple Inference in Belief Networks, Fuzzy logic.	7	15
	Total	**48**	**100**

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Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

Learning Outcome:

On successful completion of the course, the student will:

- Be familiar with Artificial Intelligence, its foundation and principles.
- Examine the useful search techniques; learn their advantages, disadvantages and comparison.
- Learn programming language to program intelligent systems.
- Understand important concepts like Expert Systems, AI applications.
- Be exposed to the role of AI in different areas like NLP, Pattern Recognition etc.
- Learn the practical applicability of intelligent systems, specifically its applications.
- Be able to develop intelligent systems.

E-Resources:

- https://nptel.ac.in/courses/106106126/

Reference Books:

1. Artificial Intelligence, Elaine Rich & Kevin Knight, TMH Publication
2. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Publication.
3. George Lugar, “AI-Structures and Strategies for Complex Problem Solving”, 4/e, 2002, Pearson Educations.
4. Introduction to Turbo PROLOG, Carl Townsend, BPB Publication.
5. Introduction to AI & Expert Systems, Dan W. Patterson, PHI Publication.
6. “PROLOG Programming For Artificial Intelligence” -By Ivan Bratko(Addison-Wesley)

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List of experiments:

Sr. No	Name of Experiment
1.	Study of facts, objects, predicates and variables, Rules, Unification in PROLOG.
2.	Write a program to implement “cut” and “fail” predicate in PROLOG.
3.	Write a program to implement arithmetic operators, simple input/output and compound goals in PROLOG.
4.	Write a program to implement recursion in PROLOG.
5.	Write a program to implement Lists in PROLOG.
6.	Write a program to implement string operations in PROLOG. Implement string operations like substring, String position, palindrome etc.)
7.	Write a prolog program to maintain family tree.
8.	Write a program to implement BFS (for 8 puzzle problem or Water Jug problem or any AI search problem).
9.	Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem)
10.	Write a program to Implement A* Algorithm.
11.	Write a program to solve travelling salesman problem using Prolog.
12.	Study of dynamic database in PROLOG.