

CS-371 Artificial Intelligence(3-0)

1. Course Information

Course Number and Title:	CS-371 Artificial Intelligence
Credits:	(3+0)
Instructor(s)-in-charge:	
Course type:	Lecture
Required or Elective:	Required
Course pre-requisites	NA
Degree and Semester	
Month and Year	Fall 2025

2. Course Schedule

Lecture:	3 hrs/week, Meets twice weekly
Lab:	3 hrs/week, Meets once in a week
Discussion:	1 hrs/week
Office Hours :	3 hrs/week by instructor, 3 hrs/week by lab engineer

3. Course Assessment

Exam:	1 Midterm and 1 Final Examination	
Home work:	3 Assignments	
Lab reports:	14Reports	
Design reports:	1 Design (CEP) report based on Semester Project	
Quizzes:	5 Quizzes	
Grading:	Quizzes:	10%
	Assignments:	5%
	1 MID Term Exam	30%
	Final Exam:	50%
	Semester Project/ Lab:	5%

4. Course book and Related Course Material

Textbooks:	S. Russell and P. Norvig. Artificial Intelligence: A Modern Approach. Prentice Hall, 4th edition, 2021
Reference Books:	Richard S. Sutton and Andrew G. Barto. Reinforcement Learning: An Introduction, 2nd Edition

5. Catalog Descriptions

In this course Students are taught fundamental concepts of Artificial Intelligence (AI) and their application for designing and implementation of intelligent agents that solve real-world AI problems.

6. Course Objectives

Objective for this course is to give the student an overview of this field while exploring in-depth the most fundamental areas. Course will teach students about the different AI techniques such as searching, reasoning, game playing etc. By the end of the course, student would have a proficient knowledge of the field and will be able to utilize the AI techniques as necessary to solve real-world problem. Student will also be fluent in writing programs that use AI algorithms.

7. Topics covered in the Course and Level of Coverage

Topics	Chapters	CLO	Weeks
Introduction to AI <ul style="list-style-type: none"> • Introduction to AI Systems • Theory, history and applications 	Chapter 1	1	1
Design of Intelligent Agents <ul style="list-style-type: none"> • Agents and Environments • Nature of Agents • Structure of Agents 	Chapter 2	1	2
<ul style="list-style-type: none"> • Search Agents and Problem Formulation • Example Problems 			3
Uninformed Search <ul style="list-style-type: none"> • Breadth-first Search • Dijkstra's algorithm 	Chapter 3	1	4
<ul style="list-style-type: none"> • Depth-first Search • Depth-limited Search 			5
<ul style="list-style-type: none"> • Iterative-deepening Search • Uniform-cost Search 			6
Informed Search <ul style="list-style-type: none"> • Heuristic Search Basics • Greedy search • A* Search 		2	7
Local Search <ul style="list-style-type: none"> • Hill climbing • Simulated Annealing • Genetic Algorithm 	Chapter 4	2	8
MID TERM EXAM			
Game Playing <ul style="list-style-type: none"> • Adversarial Search and Game Formulation • Minimax Algorithm, $\alpha - \beta$ Pruning 	Chapter 5	2	10
Knowledge Based Agents <ul style="list-style-type: none"> • Knowledge representation • Inference in Predicate 	Chapter 7	3	11
<ul style="list-style-type: none"> • First Order Logic • Forward & Backward Chaining 	Chapter 8	3	12
Constraint Satisfaction Problem <ul style="list-style-type: none"> • Problem Formulation • CSP Backtracking 	Chapter 6	3	13
Learning Agents <ul style="list-style-type: none"> • Introduction to Machine Learning • Types of Machine Learning 	Chapter 5	2	14
<ul style="list-style-type: none"> • Introduction to Neural Networks • Deep Learning Introduction 	Chapter 19	3	15
Reinforcement Learning	Chapter 22	3	16

<ul style="list-style-type: none"> • Markov Decision Process • Finding Optimum Policy 			
<ul style="list-style-type: none"> • Greedy Decision Making • Q-Learning 			17
FINAL TERM EXAM			

8. Lab Experiments

Lab 01	Introduction: How to Implement Algorithms
Lab 02	Intelligent Agents: Designing agents that perceive and act in an environment.
Lab 03	Depth First Search: Implementing DFS for graph/tree traversal problems.
Lab 04	Breadth First Search: Applying BFS to explore pathfinding.
Lab 05	Iterative Deepening Search: Combining DFS's space efficiency with BFS's completeness.
Lab 06	Uniform Cost Search: Exploring cost-based pathfinding using UCS algorithm.
Lab 07	Travelling Salesman Problem: Solving TSP using search or approximation strategies.
Lab 08	Open Ended Lab
Lab 09	A* Algorithm: Heuristic-based optimal pathfinding using A* search.
Lab 10	8 Puzzle Problem: Solving the sliding tile puzzle using search techniques.
Lab 11	Hill Climbing: Local search using greedy optimization for AI problems.
Lab 12	Simulated Annealing Algorithm: Global optimization using probabilistic metaheuristics.
Lab 13	First Order Logic: Representing knowledge using predicates and quantifiers.
Lab 14	Inference in First Order Logic: Applying resolution and unification for logical inference.
Lab 15	Forward Chaining: Rule-based reasoning in knowledge-based systems.
Lab 16	Lab Final

9. Course Outcomes and their Relation to Program Outcomes (Mapping CLO to PLO)

Course Learning Outcome (CLOs)		PLOs	Learning Level
CLO 1	Understand Artificial Intelligence techniques for building well-engineered and efficient intelligent systems.	1	C2
CLO 2	Identify the nature of AI problem and formulate the solution as a particular type.	2	C2
CLO 3	Compare AI problems in terms of computational complexity and efficiency.	4	C4
CLO 4	Ability to use modern tools and programming environments to formulate the solution according to AI principles	5	P2
CLO 5	Demonstrate ability to work effectively as an individual or in a team.	9	A2

10. Mapping of CLOs to Program Learning Outcomes

PLOs / CLOs	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
PLO:1 (Engineering Knowledge)	C2				
PLO:2 (Problem Analysis)		C2			
PLO:3 (Design/ Development of Solutions)			C4		
PLO:4 (Investigation)					

PLO:5 (Modern Tool Usage)				P2	
PLO:6 (The Engineer and Society)					
PLO:7 (Environment and Sustainability)					
PLO:8 (Professional Ethics)					
PLO:9 (Individual and Team Work)					A2
PLO:10 (Communication)					
PLO:11 (Project Management)					
PLO:12 (Lifelong Learning)					

11. Program Learning Outcomes

PLO 1	Engineering Knowledge
	An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PLO 2	Problem Analysis
	An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PLO 3	Design/Development of Solutions
	An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PLO 4	Investigation
	An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.
PLO 5	Modern Tool Usage
	An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.
PLO 6	The Engineer and Society
	An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
PLO 7	Environment and Sustainability
	An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
PLO 8	Professional Ethics
	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PLO 9	Individual and Teamwork
	An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.
PLO 10	Communication
	An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PLO 11	Project Management
	An ability to demonstrate management skills and apply engineering principles to one's own work, as

	a member and/or leader in a team, to manage projects in a multidisciplinary environment.
PLO 12	Lifelong Learning
	Lifelong Learning: An ability to recognize the need for, and have the preparation and ability to engage in, independent and life-long learning in the broadest context of technological change.