Ahmedabad
University

Course	CSE518 Artificial Intelligence	Semester	Monsoon Semester 2024
Faculty Name(s)	Shashi Prabh	Contact	shashi.prabh@ahduni.edu.in
School	SEAS	Credits	3
GER Category:	GER, but not one of the above specified Categories	Teaching Pedagogy Enable:NO	P/NP Course: Can not be taken as P/NP

Schedule	Section 1	01:00 pm to 02:30 pm	Mon	01-08-24 to 26-11-24
		01:00 pm to 02:30 pm	Fri	01-08-24 to 26-11-24

Prerequisite	CSC104 Introduction to Computation and Programming & CSC210 Data Structures and Algorithms/CSE210 Data Structures and Algorithms & MAT101 Discrete Mathematics & MAT202 Probability and Random Processes
Antirequisite	Not Applicable
Corequisite	Not Applicable
Course Description	Artificial intelligence (AI) is bound to impact human life in a big way. The syllabus is State spaces, Search (uninformed, informed, local), Games and adversarial search, Logical inference, Constraint satisfaction problems, Bayesian networks, Markov chains, Hidden Markov models, Forward and Viterbi algorithms, Markov decision processes, Machine learning, Neural networks, Reinforcement learning, Deep learning and AI for Robotics.

Course Objectives	- Learn the fundamentals of Artificial Intelligence. - Learn to represent knowledge. - Learn to build autonomous agents that can make efficient decisions in fully informed, uncertain and adversarial environments.
Learning Outcomes	- Recognise artificial intelligence systems. - Understand various ways of designing intelligent systems. - Ability to implement the search, planning and decision making strategies.
Pedagogy	- Lectures - Flipped class room - Project based learning - Use of online learning management systems
Expectation From Students	- Sincerity and honesty. - Doing programming exercises seriously on one's own. - Preparedness to work 2X to 3X hours for every X hour in the class. - Team work for the final project.
Assessment/Evaluation	- Mid-Semester Examination: - Mid Sem Examiniation - 35% - End Semester Examination: - Written - 35% - Other Components: - Assignment - 10% - Quiz - 10% - Project - 10%
Attendance Policy	As per Ahmedabad University Policy.
Project / Assignment Details	There will be two quizzes with 10% total weight. There will be homework and six programming assignments with 10% total weight, and a project with 10% weight.

Course Material	Text Book(s)
	• AI: A Modern Approach, Stuart Russell and Peter Norvig, 4 Edition, Pearson, Year: 2020,
	Reference Book
	• KNOWLEDGE REPRESENTATION AND REASONING, Ronald J. Brachman Hector J. Levesque, Morgan Kaufman, Year: 2004,
	Other Course Material
	• https://classroom.udacity.com/courses/cs271 (https://classroom.udacity.com/courses/cs271),
	• https://www.cin.ufpe.br/~mtcfa/files/in1122/Knowledge%20Representation%20and%20Reasoning.pdf (https://www.cin.ufpe.br/~mtcfa/files/in1122/Knowledge%20Representation%20and%20Reasoning.pdf),
	• https://swayam.gov.in/nd1_noc20_cs42/preview (https://swayam.gov.in/nd1_noc20_cs42/preview),
	• https://nptel.ac.in/courses/106/106/106106140/ (https://nptel.ac.in/courses/106/106/106106140/),
	• https://classroom.udacity.com/courses/cs271 (https://classroom.udacity.com/courses/cs271),
Additional Information	Office Hours
	Tuesdays 2.00 pm to 3.00 pm

Session Plan

NO.	TOPIC TITLE	TOPIC & SUBTOPIC DETAILS	READINGS,CASES,ETC.	ACTIVITIES	IMPORTANT DATES
1	Introduction	What is AI, Foundations of AI, Current state of AI	Ch: 1	Reading, interactions, Discussions	
2	Intelligent Agents	Agents and Environment, Rationality, Nature of Environment, Structure of Agent	Ch:2	Discussions	
3	Search Algorithms	Problem solving agents, Best-first Search, Uninformed Search: Breadth First Search, Uniform cost search, Depth First Search	Ch 3.1-3.4	Programming, Discussions	
4	Search Algorithms	Informed Search: Greedy Best First search, A* search, Heuristic functions	Ch 3.5-3.6	Programming, Quiz	
5	Adversarial Search	Game Theory, Game Trees, Stochastic Games	Ch. 5.1-5.5	Pen and Paper exercises, discussions	
6	Making Simple Decisions	Utility Theory, Utility Functions, Decision Networks, Value of Perfect Information	Ch. 16.1-16.6	Pen and Paper exercises, discussions	
7	Making complex decisions I	Markov Decision Process	Ch. 17.1	Pen and Paper exercises, discussions	
8	Making complex decisions I	Algorithms for MDPs, Bandit Problems	Ch. 17.2-17.3	Pen and Paper exercises, discussions	
9	Reinforcement Learning	Learning from Rewards, Passive and Active RL, Policy Search	Ch. 22	Pen and Paper exercises, discussions	
10	Constraint Satisfaction Problems	CSP, Inference in CSPs	Ch. 6.1-6.2	Pen and Paper exercises, discussions	

11	Constraint Satisfaction Problems	Backtracking and local search for CSPs	Ch. 6.3-6.5	Pen and Paper exercises, discussions	
12	Logical Agents	Logic, Propositional Logic, Propositional Theorem Proving	Ch 7.1-7.4	Pen and Paper exercises, discussions	
13	Logical Agents	Propositional Theorem Proving, Propositional Model Checking, Propositional Logic Agents	Ch:7.5-7.7	Pen and Paper exercises, discussions	
14	First Order Logic	Introdution, Syntax and Semantics	Ch:8.1-8.2	Pen and Paper exercises, discussions	
15	First Order Logic	Using FOL, Knowledge Engineering	Ch:8.3-8.4	Pen and Paper exercises, discussions	
16	Inference in FOL	Propositional vs. FOL Inference, Unification and FOL, Forward Chaining, Backward Chaining	Ch:9.1-9.4	Quiz, Pen and Paper, discussions	
17	Mid-Semester Exam	Topics covered till date		Exam	
18	Automated Planning	Algorithms and Heuristics for Classical Planning,	Ch: 11.1-11.3	Reading, Discussions, programming	
19	Automated Planning	Hierarchical Planning, Planning in Non-Deterministics Domains, Scheduling	Ch: 11.4-11.6	Reading, Discussions, programming	
20	Automated Planning	Heuristics for planning: Domain independent pruning, state abstraction in planning	Ch:11	Pen and Paper exercises	
21	Probability	Representing knowledge in uncertain domain, Semantics of Bayesian Network, conditional independence relations, case study	Ch: 12	Pen and Paper exercises	
22	Probabilistic Reasoning	Bayesian Networks, Representation	Ch:13.1-13.2	Pen and Paper exercises	

23	Probabilistic Reasoning	Bayesian Networks Inference	Ch:13.3-13.5	Pen and Paper exercises, discussions	
24	Probabilistic Reasoning over time I	Time and Uncertainty, inference in temporal models, Hidden Markov Model	Ch:14.1-14.3	Reading, interactions, Discussions	
25	Probabilistic Reasoning over time II	Kalman Filters, Dynamic Bayesian Networks	Ch:14.4-14.5	Programming	
26	Multiagent decision making II	Multiagent Environments, Non-cooperative Game Theory	Ch:18.1-18.2	Programming, pen and paper, discussions	
27	Multiagent decision making II	Cooperative Game Theory	Ch:18.3-18.4	Programming, Quiz	
28	Machine Learning I	Learning from examples, Model Selection, Theory of Learning, Linear Regression	Ch:19	Reading, interactions, Discussions	
29	Machine Learning II	Deep Learning	Ch:21	Programming, Discussions	
30	Epilogue	Summarisation	Ch:1 to 22	Discussions	
31	Reflections and Reviews	Self Reflections	Whole Curriculum	Reflections	
32	End semester Exam		Whole Curriculum	Exam	