Lovely Professional University, Punjab

Course Code	Course Title	Course Planner
INT404	ARTIFICIAL INTELLIGENCE	20339::Usha Mittal

Course Outcomes :Through this course students should be able to

CO1 :: describe basic knowledge representation, problem solving, and learning methods of artificial intelligence.

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CO2 :: compare various search techniques used to solve AI problems.

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CO3 :: use analytical concepts for solving logical problems using heuristics approaches.

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CO4 :: examine the various statistical reasoning techniques to solve AI problems.

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CO5 :: justify the performance of different game playing algorithms.

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CO6 :: discuss the concepts of machine learning, fuzzy logic, genetic algorithms and NLP.

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	TextBooks (T)		
Sr No	**Title**	**Author**	**Publisher Name**
T-1	ARTIFICIAL INTELLIGENCE	RICH, KNIGHT	MCGRAW HILL EDUCATION

	Reference Books (R)		
Sr No	**Title**	**Author**	**Publisher Name**
R-1	ARTIFICIAL INTELLIGENCE	KEVIN KNIGHT, ELAINE RICH, B. SHIVASHANKAR NAIR	Tata McGraw Hill, India
R-2	ARTIFICIAL INTELLIGENCE AND INTELLIGENT SYSTEM	N. P. PADHY	OXFORD UNIVERSITY PRESS

Relevant Websites (RW)		
Sr No	**(Web address) (only if relevant to the course)**	**Salient Features**
RW-1	https://www.geeksforgeeks.org/fuzzy-logic-introduction/	Fuzzy
RW-2	https://towardsdatascience.com/introduction-to-genetic-algorithms-including-example-code-e396e98d8bf3	Genetic algorithm
RW-3	https://www.edureka.co/blog/what-is-machine-learning/	Machine Learning
RW-4	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_natural_language_processing.htm	NLP
RW-5	https://www.cs.odu.edu/~cs381/cs381content/logic/pred_logic/intr_to_pred_logic.html	Predicate logic

Audio Visual Aids (AV)		
Sr No	**(AV aids) (only if relevant to the course)**	**Salient Features**
AV-1	https://nptel.ac.in/courses/106106126/	Nptel

LTP week distribution: (LTP Weeks)	
Weeks before MTE	7
Weeks After MTE	7
Spill Over (Lecture)	7

Detailed Plan For Lectures

Week Number	Lecture Number	Broad Topic(Sub Topic)	Chapters/Sections of Text/reference books	Other Readings, Relevant Websites, Audio Visual Aids, software and Virtual Labs	Lecture Description	Learning Outcomes	Pedagogical Tool Demonstration/ Case Study / Images / animation / ppt etc. Planned	Live Examples
Week 1	Lecture 1	Introduction(What is intelligence?)	T-1		Lecture 1 is used for Lecture Zero.	Students will understand basics of AI, AI history and foundations of AI.	Power Point Presentation	
		Introduction(what is artificial intelligence?,)	T-1		Lecture 1 is used for Lecture Zero.	Students will understand basics of AI, AI history and foundations of AI.	Power Point Presentation	
		Introduction(Foundations of artificial intelligence(AI))	T-1		Lecture 1 is used for Lecture Zero.	Students will understand basics of AI, AI history and foundations of AI.	Power Point Presentation	
		Introduction(History of AI)	T-1		Lecture 1 is used for Lecture Zero.	Students will understand basics of AI, AI history and foundations of AI.	Power Point Presentation	
		Introduction(Basics of AI)	T-1	AV-1	Lecture 1 is used for Lecture Zero.	Students will understand basics of AI, AI history and foundations of AI.	Power Point Presentation	
	Lecture 2	Introduction(Artificial Intelligence Problems)	T-1 R-1		Lecture 2 should be used to discuss AI problems, techniques and AI applications.	Students will learn about AI techniques and its applications	Demonstration using Power Point Presentation	Driver-less car, AI robots. Alexa, sophia
		Introduction(Artificial Intelligence Techniques)	T-1 R-1		Lecture 2 should be used to discuss AI problems, techniques and AI applications.	Students will learn about AI techniques and its applications	Demonstration using Power Point Presentation	Driver-less car, AI robots. Alexa, sophia
		Introduction(applications of AI)	T-1 R-1		Lecture 2 should be used to discuss AI problems, techniques and AI applications.	Students will learn about AI techniques and its applications	Demonstration using Power Point Presentation	Driver-less car, AI robots. Alexa, sophia
	Lecture 3	Problem Spaces and Search (Defining the problem as a state space search)	T-1 R-1		Lecture 3 should be used to discuss the problem as state space search.	Students will learn how to use state space search for solving AI problems.	Driver-less car, AI robots. Alexa, sophia	TIc tac toe, water jug
		Problem Spaces and Search (Issues in designing search problems)	T-1 R-1		Lecture 3 should be used to discuss the problem as state space search.	Students will learn how to use state space search for solving AI problems.	Driver-less car, AI robots. Alexa, sophia	TIc tac toe, water jug

Week 2	Lecture 4	Problem Spaces and Search (Production systems)	T-1		Lecture 4 should be used to discuss Problem characteristics, production system and its characyeristics.	Students will learn about problem characteristics and production system.	Demonstration using Power Point Presentation	tic tac toe, water jug, eight puzzle solver
		Problem Spaces and Search (Production system characteristics)	T-1		Lecture 4 should be used to discuss Problem characteristics, production system and its characyeristics.	Students will learn about problem characteristics and production system.	Demonstration using Power Point Presentation	tic tac toe, water jug, eight puzzle solver
		Problem Spaces and Search (Problem characteristics)	T-1		Lecture 4 should be used to discuss Problem characteristics, production system and its characyeristics.	Students will learn about problem characteristics and production system.	Demonstration using Power Point Presentation	tic tac toe, water jug, eight puzzle solver
	Lecture 5	Problem Spaces and Search (Breadth first search (BFS))	T-1		Lecture 5 should be used to discuss BFS and DFS to solve AI problems.	Students will learn how to apply BFS and DFS to solve AI problems.	Lecture delivery using Power Point Presentation, problem-based learning	Apply BFS and DFS on WaterJugProblem, 8 puzzle solver
		Problem Spaces and Search (Depth first search(DFS))	T-1		Lecture 5 should be used to discuss BFS and DFS to solve AI problems.	Students will learn how to apply BFS and DFS to solve AI problems.	Lecture delivery using Power Point Presentation, problem-based learning	Apply BFS and DFS on WaterJugProblem, 8 puzzle solver
	Lecture 6	Problem Spaces and Search (Bi-directional Search)	T-1		Lecture 6 should be used to discuss bi-directional search and iterative deepening.	Students will learn how to use bi-directional search and iterative deepening.	Lecture delivery using Power Point Presentation, problem-based learning	
		Problem Spaces and Search (Iterative Deepening)	T-1		Lecture 6 should be used to discuss bi-directional search and iterative deepening.	Students will learn how to use bi-directional search and iterative deepening.	Lecture delivery using Power Point Presentation, problem-based learning	
Week 3	Lecture 7	Informed Search Strategies (Heuristic functions)	T-1		Lecture 7 should be used to discuss generate and test and heuristic functions.	Students will learn how to use heuristic techniques to solve AI problems	Lecture delivery using Power Point Presentation, problem-based learning	
		Informed Search Strategies (Generate and Test)	T-1		Lecture 7 should be used to discuss generate and test and heuristic functions.	Students will learn how to use heuristic techniques to solve AI problems	Lecture delivery using Power Point Presentation, problem-based learning	

Week 3	Lecture 8	Informed Search Strategies (Hill Climbing)	T-1 R-1 R-2		Lecture 8 should be used to discuss hill climbing and its variants.	Students will learn how to solve AI problems using hill climbing and its variants.	Lecture delivery using Power Point Presentation, problem-based learning	Solve water jug problem using hill climbing technique
	Lecture 9	Informed Search Strategies (Simulated Annealing)	T-1		Lecture 9 should be used to discuss simulated annealing technique.	Students will learn how to apply AI problems using simulated annealing.	Demonstration using Power Point Presentation, problem-based learning	Solve water jug problem using simulated annealing.
Week 4	Lecture 10	Informed Search Strategies (Best first search)	T-1		Lecture 10 should be used to discuss OR graph and best first technique to solve AI problems.	Students will learn how to use OR graph to solve AI problems.	Demonstration using Power Point Presentation, problem-based learning	Solve water jug problem using OR graph
	Lecture 11	Informed Search Strategies (A* algorithm)	T-1		Lecture 11 should be utilized to discuss A* algorithm.	Students will learn how to solve AI problems using A* algorithm.	Demonstration using Power Point Presentation, problem-based learning	
	Lecture 12	Informed Search Strategies (Constraint satisfaction)	T-1 R-1		Lecture 12 should be used to discuss constraint satisfaction technique for problem solving.	Students will learn how to use constraint satisfaction	Demonstration using Power Point Presentation, problem-based learning	
Week 5	Lecture 13	Knowledge Representation (Representations & mappings)	T-1		Lecture 13 should be used to discuss knowledge representation approaches and issues in knowledge representation.	Students will learn various approaches of knowledge representation and issues in knowledge representation.	Demonstration using Power Point Presentation	
		Knowledge Representation (Approaches in knowledge representation)	T-1		Lecture 13 should be used to discuss knowledge representation approaches and issues in knowledge representation.	Students will learn various approaches of knowledge representation and issues in knowledge representation.	Demonstration using Power Point Presentation	
		Knowledge Representation (Issues in knowledge representation)	T-1		Lecture 13 should be used to discuss knowledge representation approaches and issues in knowledge representation.	Students will learn various approaches of knowledge representation and issues in knowledge representation.	Demonstration using Power Point Presentation	

Week 5	Lecture 14	Knowledge Representation (Propositional logic)	T-1		Lecture 14 should be used to discuss propositional logic.	Students will learn basics of Propositional logic in knowledge based representation.	Demonstration using Power Point Presentation	
	Lecture 15				Online Assignment			
Week 6	Lecture 16	Knowledge Representation (Predicate logic)	T-1	RW-5	Lecture 16 should be discuss predicate logic.	Students will learn basics of Predicate logic in knowledge based representation.	Demonstration using Power Point Presentation	
	Lecture 17	Knowledge Representation (Procedural versus declarative knowledge)	T-1		Lecture 17 should be used to discuss procedural vs declarative knowledge.	Students will learn the difference between procedural and declarative knowledge.	Demonstration using Power Point Presentation	
	Lecture 18	Knowledge Representation (Logic programming)	T-1		Lecture 18 should be used to discuss introduction to logic programming and building blocks of logic programming.	Students will learn about the logic programming and its building blocks	Demonstration using Power Point Presentation	
Week 7	Lecture 19	Knowledge Representation (Forward versus backward reasoning)	T-1		Lecture 19 should be used to discuss forward and backward reasoning.	Student will learn about the reasoning process using backward and forward reasoning	Demonstration using Power Point Presentation, problem-based learning.	
		SPILL OVER						
Week 7	Lecture 20				Spill Over			
	Lecture 21				Spill Over			
		MID-TERM						
Week 8	Lecture 22	Statistical reasoning (Probability & Bayes' theorem)	T-1 R-1		Lecture 22 should be used to discuss bayes theorem and bayesian networks.	Students will learn how to perform reasoning using bayes theorem and bayesian network.	Demonstration using Power Point Presentation, problem-based learning.	

Week 8	Lecture 22	Statistical reasoning (Bayesian networks)	T-1 R-1		Lecture 22 should be used to discuss bayes theorem and bayesian networks.	Students will learn how to perform reasoning using bayes theorem and bayesian network.	Demonstration using Power Point Presentation, problem-based learning.	
	Lecture 23	Statistical reasoning (Dempster-Shafer-Theory)	T-1		Lecture 23 should be used to discuss dempster shafer theory and certainty factors, rule based systems.	Students will learn about dempster shafer theory and certainty factors, rule based systems.	Demonstration using Power Point Presentation, problem-based learning.	
		Statistical reasoning (Certainty factors & rule-based systems)	T-1		Lecture 23 should be used to discuss dempster shafer theory and certainty factors, rule based systems.	Students will learn about dempster shafer theory and certainty factors, rule based systems.	Demonstration using Power Point Presentation, problem-based learning.	
	Lecture 24	Weak slot and filler structures(Semantic nets)	T-1		Lecture 24 should be used to discuss semantic nets.	Students will learn how to represent knowledge using semantic nets.	Demonstration using Power Point Presentation, problem-based learning.	
Week 9	Lecture 25	Weak slot and filler structures(Frames)	T-1		Lecture 25 should be used to discuss frames.	Students will learn how to represent knowledge using frames.	Demonstration using Power Point Presentation, problem-based learning.	
	Lecture 26	Strong slot and filler structures(Conceptual dependency)	T-1		Lecture 26 should be used to discuss conceptual dependency.	Students will learn how to represent knowledge using conceptual dependency.	Demonstration using Power Point Presentation, problem-based learning.	
	Lecture 27	Strong slot and filler structures(Scripts)	T-1		Lecture 27 should be used to discuss scripts.	Students will learn how to represent knowledge using scripts.	Demonstration using Power Point Presentation, problem-based learning.	
Week 10	Lecture 28				Online Assignment			

Week 10	Lecture 29	Game playing(Minmax Problem)	T-1		Lecture 29 should be used to discuss minmax problem and min max search procedure.	Students will learn how to use min max algorithm to play game.	Demonstration using Power Point Presentation, problem-based learning.	
		Game playing(The min-max search procedure)	T-1		Lecture 29 should be used to discuss minmax problem and min max search procedure.	Students will learn how to use min max algorithm to play game.	Demonstration using Power Point Presentation, problem-based learning.	
	Lecture 30	Game playing(Alpha-beta pruning)	T-1		Lecture 30 should be used to discuss alpha beta pruning.	Students will learn how to use alpha beta pruning to play games.	Demonstration using Power Point Presentation, problem-based learning.	
Week 11	Lecture 31	Natural Language Processing(Introduction to NLP and information retrieval)	T-1	RW-4	Lecture 31 should be used to discuss introduction to NLP and its phases.	Students will learn about basics of NLP and its phases.	Demonstration using Power Point Presentation.	
		Natural Language Processing(NLP phases)	T-1		Lecture 31 should be used to discuss introduction to NLP and its phases.	Students will learn about basics of NLP and its phases.	Demonstration using Power Point Presentation.	
	Lecture 32	Natural Language Processing(Spell checking)	T-1		Lecture 32 should be used to discuss spell checking, soundex algorithm and construction of parse tree.	Students will learn about spell checking, soundex algorithm and construction of parse tree.	Demonstration using Power Point Presentation, problem-based learning.	
		Natural Language Processing(Soundex algorithm)	T-1		Lecture 32 should be used to discuss spell checking, soundex algorithm and construction of parse tree.	Students will learn about spell checking, soundex algorithm and construction of parse tree.	Demonstration using Power Point Presentation, problem-based learning.	
		Natural Language Processing(construction of parse tree)	T-1		Lecture 32 should be used to discuss spell checking, soundex algorithm and construction of parse tree.	Students will learn about spell checking, soundex algorithm and construction of parse tree.	Demonstration using Power Point Presentation, problem-based learning.	

Week 11	Lecture 33	Natural Language Processing(bag of words model)	T-1		Lecture 33 should be used to discuss applications of NLP and bag of words model.	Students will learn about applications of NLP and bag of words model.	Demonstration using Power Point Presentation, problem-based learning.	
		Natural Language Processing(Applications of NLP)	T-1		Lecture 33 should be used to discuss applications of NLP and bag of words model.	Students will learn about applications of NLP and bag of words model.	Demonstration using Power Point Presentation, problem-based learning.	
Week 12	Lecture 34				Online Assignment			
	Lecture 35	Advanced topics in Artificial Intelligence(introduction to machine learning)	T-1 R-1 R-2	RW-3	Lecture 35 should be used to discuss basics of machine learning and types of machine learning.	Students will learn about machine learning ang types of machine learning.	Demonstration using Power Point Presentation, problem-based learning.	
		Advanced topics in Artificial Intelligence(Types of Machine Learning)	T-1 R-1 R-2		Lecture 35 should be used to discuss basics of machine learning and types of machine learning.	Students will learn about machine learning ang types of machine learning.	Demonstration using Power Point Presentation, problem-based learning.	
	Lecture 36	Advanced topics in Artificial Intelligence(Overview of Neural Networks)	T-1 R-1		Lecture 36 should be used to learn about neural networks.	Students will learn how neural networks work and used to solve AND, OR logic	Demonstration using Power Point Presentation, problem-based learning.	
Week 13	Lecture 37	Advanced topics in Artificial Intelligence(activation functions)	T-1 R-1		Lecture 37 should be used to discuss activation functions.	Students will learn about activation functions and their importance.	Demonstration using Power Point Presentation, problem-based learning.	
	Lecture 38	Advanced topics in Artificial Intelligence(Overview of Genetic Algorithms)	T-1 R-1	RW-2	Lecture 38 and 39 should be used to discuss genetic algorithm and its applications.	Students will learn how to use genetic algorithm for problem optimization.	Demonstration using Power Point Presentation, problem-based learning.	

Week 13	Lecture 39	Advanced topics in Artificial Intelligence(Overview of Genetic Algorithms)	T-1 R-1	RW-2	Lecture 38 and 39 should be used to discuss genetic algorithm and its applications.	Students will learn how to use genetic algorithm for problem optimization.	Demonstration using Power Point Presentation, problem-based learning.	
Week 14	Lecture 40	Advanced topics in Artificial Intelligence(Overview of Fuzzy Logics)	T-1 R-1	RW-1	Lecture 40 should be used to discuss fuzzy logic.	Students will learn how to build rule based systems using fuzzy logic	Demonstration using Power Point Presentation, problem-based learning.	
		SPILL OVER						
Week 14	Lecture 41				Spill Over			
	Lecture 42				Spill Over			
Week 15	Lecture 43				Spill Over			
	Lecture 44				Spill Over			
	Lecture 45				Spill Over			

Plan for Tutorial: (Please do not use these time slots for syllabus coverage)

Tutorial No.	Lecture Topic	Type of pedagogical tool(s) planned (case analysis,problem solving test,role play,business game etc)
Tutorial1	Discuss the different problems like water jug, 8 puzzle, M-C problem	Problem Solving
Tutorial2	Apply BFS and DFS for solving AI problems.	Problem Solving
Tutorial3	Apply Different Hill Climbing techniques to solve AI problems	Problem Solving
Tutorial4	Apply OR graph and A* algorithm to solve AI problems	Problem Solving
Tutorial5	Solve cryptarithmetic problems using constraint satisfaction	Problem Solving
Tutorial6	Knowledge representation using prepositional logic and predicate logic. Conversion of predicate logic to CNF.	Problem Solving
Tutorial7	Reasoning using resolution	Problem Solving
After Mid-Term		
Tutorial8	Reasoning using bayes theorem and bayesian network.	Problem Solving
Tutorial9	Reasoning using certainty factor and dempster shafer theory	Problem Solving
Tutorial10	Knowledge representation using semantic nets and frames	Problem Solving

An instruction plan is only a tentative plan. The teacher may make some changes in his/her teaching plan. The students are advised to use syllabus for preparation of all examinations. The students are expected to keep themselves updated on the contemporary issues related to the course. Upto 20% of the questions in any examination/Academic tasks can be asked from such issues even if not explicitly mentioned in the instruction plan.

Tutorial11	Knowledge representation using conceptual dependency and scripts	Problem Solving
Tutorial12	Game playing using minmax algorithm and alpha beta pruning	Problem Solving
Tutorial13	Spell check and construction of parse tree	Problem Solving
Tutorial14	Solving AND, OR logic using neural networks	Problem Solving