



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Course / Subject Code : 3164802

Course / Subject Name : Artificial Intelligence

w. e. f. Academic Year:	2024-25
Semester:	6
Category of the Course:	PCC

Prerequisite:	Data Structures, Mathematics
Rationale:	With the usage of the Internet and World Wide Web increasing day by day, the field of AI and its techniques are being used in many areas which directly affect human life. Various techniques for encoding knowledge in computer systems such as Predicate Logic, Production rules, Semantic networks find application in real world problems. The fields of AI such as Game Playing, Natural Language Processing, and Connectionist Models are also important. Students should know some programming language for AI.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
1	Understand the search technique procedures applied to real world problems.	U
2	Analyse, Understand and use various types of logic and knowledge representation schemes	A
3	Apply various Game Playing techniques and apply them in programs.	Ap
4	Gain knowledge in AI Applications and advances in Artificial Intelligence	E
5	Use Prolog Programming language using predicate logic	C

*Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
4	0	2	5	70	30	20	30	150



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Course Content:

Unit No.	Content	No. of Hours
1.	Introduction: The AI Problems, The Underlying Assumption, AI techniques, The Level of The Model, Criteria for Success	03
2.	Problems, State Space Search & Heuristic Search Techniques: Defining The Problems As A State Space Search, Production Systems, Production Characteristics, Production System Characteristics and Issues in the Design of Search Programs, Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.	06
3	Knowledge Representation: Representations And Mappings, Approaches To Knowledge Representation, Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Computable Functions and Predicates, Resolution, Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning.	08
4	Symbolic Reasoning Under Uncertainty: Introduction To Nonmonotonic Reasoning, Logics For Non-monotonic Reasoning.	02
5.	Probabilistic Reasoning: Probability And Bays' Theorem, Certainty Factors And Rule Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic	03
6.	Game Playing: Overview, MiniMax Search Procedure, Alpha-Beta Cut-offs, Refinements, Iterative deepening.	05
7.	Planning: The Blocks World, Components Of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems	04
8.	Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse And Pragmatic Processing, Spell Checking	04
9.	Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI And Symbolic AI.	04
10.	Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.	02
11.	Genetic Algorithms: A Peek into the Biological World, Genetic Algorithms (GAs), Significance of the Genetic Operators, Termination Parameters.	04
12.	Introduction to Prolog: Introduction, Converting English to Prolog Facts and Rules, Goals, Prolog Terminology, Variables, Control Structures, Arithmetic Operators, Matching in Prolog, Backtracking, Cuts, Recursion, Lists.	04

Suggested Specification Table with Marks (Theory):



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Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	10	05	05

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. "Artificial Intelligence" -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill
2. "Artificial Intelligence: A Modern Approach" -By Stuart Russel, Peter Norvig, PHI
3. "Introduction to Prolog Programming" -By Carl Townsend.
4. "PROLOG Programming For Artificial Intelligence" -By Ivan Bratko(Addison-Wesley)
5. "Programming with PROLOG" -By Klocksins and Mellish.

(b) Open source software and website:

1. Link:<https://nptel.ac.in/courses/106106226>
2. Link: <https://nptel.ac.in/courses/106102220>

List of Open Source Software/learning website:

1. <https://nptel.ac.in/courses/106/105/106105077/>
2. <http://www.journals.elsevier.com/artificial-intelligence/>

Sample List of Experiments:

1. Write a program to implement the Tic-Tac-Toe game problem. 2. Write a program to implement BFS (for 8 puzzle problems or Water Jug problems or any AI search problem) .
2. Write a program to implement BFS (for 8 puzzle problems or Water Jug problems or any AI search problem) .
3. Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem)
4. Write a program to implement Single Player Game (Using any Heuristic Function)
5. Write a program to Implement A* Algorithms.
6. Write a program to implement a minimax algorithm for any game development.
7. Assume given a set of facts of the form father(name1,name2) (name1 is the father of name2).
8. Write a program to solve the Tower of Hanoi problem using Prolog.
9. Write a program to solve N-Queens problems using Prolog.
10. Write a program to solve 8 puzzle problems using Prolog.
