



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3161608

## ARTIFICIAL INTELLIGENCE

6<sup>th</sup> SEMESTER

Type of course: Regular

**Prerequisite:** Data Structures and Algorithms, Mathematical foundations for Computer Science

**Rationale:** With the usage of 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.

### Teaching and Examination Scheme:

Teaching Scheme				Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks				
				ESE (E)	PA (M)		ESE (V)		PA (I)		
					PA	ALA	ESE	OEP			
3	0	2	4	70	20	10	20	10	20	150	

### Content

Sr. No.	Course Contents	Teaching hours	Weightage
1	<b>What is AI?</b> : The AI Problems, The Underlying Assumption, What is an AI Techniques, The Level Of The Model, Criteria For Success, Some General References, One Final Word.	2	5
2	<b>Problems, State Space Search &amp; Heuristic Search Techniques :</b> Defining The Problems As A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis, A* and AO* search.	8	15
3	<b>Logical Agents:</b> Knowledge-based agents, The Wumpus world, Logic, Propositional logic, Propositional theorem proving, Effective propositional model checking, Agents based on propositional logic. <b>First Order Logic:</b> Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic.	4	10
4	<b>Inference in First Order Logic:</b> Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution	4	10
5	<b>Uncertainty –</b> Acting under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions,	4	10
6	<b>Probabilistic Reasoning –</b> Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distribution, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks	3	10



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7	<b>Game Playing: Overview, and Example Domain :</b> Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.	5	15
8	<b>Statistical Learning Methods – Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: EM Algorithm.</b>	4	10
9	<b>Introduction to Prolog :</b> Introduction To Prolog: Syntax and Numeric Function, Basic List Manipulation Functions In Prolog,	8	15

**Suggested Specification table with Marks (Theory): (For BE only)**

<b>Distribution of Theory Marks</b>					
R Level	U Level	A Level	N Level	E Level	C Level
10	15	25	25	20	5

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

**Reference Books:**

1. "Artificial Intelligence" -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill
2. Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI
3. Nils J Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publications, 2000.
4. Introduction to Prolog Programming By Carl Townsend.
5. "PROLOG Programming For Artificial Intelligence" -By Ivan Bratko( Addison-Wesley)
6. "Programming with PROLOG" –By Klocksin and Mellish.

Sr. No.	CO statement	Marks % weightage
CO-1	Ability to understand problem solving methods and their applications	20%
CO-2	Ability to analyze Searching, knowledge representation and Inferencing Techniques	30%
CO-3	Ability to apply problem solving, knowledge representation and reasoning techniques for various applications.	30%
CO-4	Ability to demonstrate practical applications of AI Techniques.	20%

**List of Experiments:**

1. Write a program to implement Tic-Tac-Toe game problem.
2. Write a program to implement BFS (for 8 puzzle problem or Water Jug problem 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 Heuristic Function)
5. Write a program to Implement A\* Algorithm.
6. Write a program to solve N-Queens problem using Prolog.
7. Write a program to solve 8 puzzle problem using Prolog.
8. Write a program to solve travelling salesman problem using Prolog.
9. Develop a expert system for medical diagnosis of childhood diseases using prolog.
10. Write a Prolog program to count even and odd elements from list and count elements up to specific index in list.



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### Open Ended Problems:

1. Describe major subfields and paradigms of AI.
2. What are the major challenges in the field of AI?
3. How AI can be used to develop a better search Engine?

**Major Equipments:** Computer/Prolog Language

### List of Open Source Software/learning website:

1. <http://www.journals.elsevier.com/artificial-intelligence/>
2. <https://www.technologyreview.com/s/534871/our-fear-of-artificial-intelligence/>
3. <http://www.sanfoundry.com/artificial-intelligence-mcq-inductive-logic-unification-lifting-1/>