

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	BTech CSE (Artificial Intelligence & Machine Learning)
Course Code:	XXXX
Course Title:	Artificial Intelligence
Course Type:	Core
Year of Introduction:	2025-26

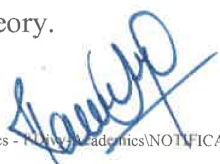
L	T	Practical Component				C
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Course Learning Outcomes (CLO):

At the end of the course, students will be able to –

1. explain the significance of Artificial Intelligence and knowledge representation (BL2)
2. demonstrate the design concepts of control and search strategies in AI Applications (BL3)
3. compare different search strategies for a given scenario (BL5)
4. develop applications using Artificial Intelligence. (BL6)

Unit	Contents	Teaching Hours (Total 45)
Unit-I	Introduction to Artificial Intelligence Overview: Knowledge: General concepts, definition, and importance of knowledge, knowledge-based system, representation, organization, manipulation, and acquisition of knowledge.	05
Unit-II	Problems, Problem Spaces and State Space Search: The AI Problems, The Underlying Assumptions, What Are AI Techniques, The Level of The Model, Criteria for Success, Some General References, One Final Word. Defining the Problems as a State Space Search, Production Systems, Production Characteristics, Production System Characteristics, and Issues in The Design of Search Programs. Search and Control Strategies: Uninformed (Blind) and informed search, DFS, BFS, Heuristic Search Techniques: Simulated Annealing, Best-First Search, A*, AO*, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.	14
Unit-III	Knowledge Representation: Knowledge Representation Issues, Representations and Mappings, Approaches to Knowledge Representation, Using Predicate Logic Representation, Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution. Representing Knowledge Using Rules, Procedural versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning.	12
Unit-IV	Reasoning: Symbolic Reasoning under Uncertainty, Introduction to Non-monotonic Reasoning, Logics for Non-monotonic Reasoning. Statistical Reasoning, Probability and Bayes' Theorem, Certainty Factors And Rule-Based Systems, Bayesian Networks, Dempster-Shafer Theory.	09



Fuzzy logic: fuzzy set theory, fuzzy reasoning, fuzzy inference systems.

Genetic Algorithms: population, fitness function, and genetic operators (selection, crossover, and mutation)

Unit-V **Game Playing:** Overview and Example Domain, Min-max Search, Adding Alpha-Beta Cutoffs. Expert System: Introduction, Architecture, and Types of Expert Systems, Expert System Shell. 05

Self-Study:

The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study content

Suggested Readings/ References:

1. Russel and Norvig, Artificial Intelligence: A modern approach, prentice Hall
2. Elaine Rich And Kevin Knight, Artificial Intelligence, Tata McGraw-Hill
3. D. W. Patterson, Artificial Intelligence and Expert Systems, Prentice Hall
4. D. W. Rolston, Artificial Intelligence and Expert System Development, McGraw-Hill
5. Ivan Bratko, PROLOG Programming for Artificial Intelligence, Addison-Wesley

Laboratory Work:

Laboratory work will be based on the above syllabus with a minimum of 10 experiments to be incorporated. The students in a suitable group size will design and perform one experiment as a part of Laboratory work.

Sr. No.	Suggested List of Experiments/Exercises	Hours
1	Explore open-source AI tools. Submit a Write-up on AI tools in the following form.	02
2	Implement a program to implement DFS (for the 8-puzzle problem)	02
3	Implement a program to implement DFS (for the 8-puzzle problem)	02
4	Implement A* algorithm and Simulated Annealing.	04
5	Write a program in PROLOG for a Query based on the family tree. Knowledge base contains the data of at least three generations.	02
6	Implement a PROLOG program based on the concept of lists.	04
7	Implement one application to demonstrate the use of a Genetic Algorithm.	02
8	Implementation of the Tic-Tac-Toe Game using the Min-Max Algorithm.	04
9	Implementation of the Tic-Tac-Toe Game using Alpha Beta Pruning.	04
10	Design an Expert System of your choice.	04