

NIRMA UNIVERSITY

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| Institute: | Institute of Technology |
| Name of Programme: | B.Tech. Computer Science and Engineering |
| Course Code: | 2CSDE85 |
| Course Title: | Artificial Intelligence |
| Course Type: | Departmental Elective |
| Year of Introduction: | 2021-22 |

Credit Scheme

| L | T | Practical Component | | | | C |
|---|---|---------------------|----|---|---|---|
| | | LPW | PW | W | S | |
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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,
2. demonstrate the design concepts of control and search strategies in AI Applications,
3. compare different search strategies for a given scenario
4. design applications using Artificial Intelligence.

Syllabus:

Total Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|----------|---|----------------|
| 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 Assumption, What Is an 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: Generate-And-Test, Hill Climbing, 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 | 12 |



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.

Unit-IV **Weak Slot-And-Filler Structure:** Semantic Nets, Frames 09

Reasoning: Symbolic Reasoning under Uncertainty, Introduction to Non-monotonic Reasoning, Logics for Non-monotonic Reasoning. Statistical Reasoning, Probability and Bay's Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dumpster-Shafer Theory.

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 semester. Around 10% of the questions will be asked from self-study contents.

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

Suggested List of Experiments:

| Sr. | Practical Title | Hours |
|-----|--|-------|
| 1 | Explore open-source AI tools. Submit write up on AI tools in following form. | 02 |

| Tool Name | Advantages/Best suitable scenarios | Applications |
|-----------|---------------------------------------|--------------|
| AIML | Natural language processing scenarios | Chatbots |

Use C/C++/JAVA/Python for following practicals:

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|---|---|----|
| 2 | Write a program to implement DFS (for 8 puzzle problem) | 02 |
| 3 | Write a program to implement BFS (for 8 puzzle problem) | 02 |

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|----|--|----|
| 4 | Write a program to implement A * (for 8 puzzle problem) | 04 |
| | Use PROLOG for the following experiments: | |
| 5 | Write a program in PROLOG for Query based on family tree. Knowledge base contain the data of at-least three generations. | 02 |
| 6 | Write a PROLOG program on lists | 02 |
| | i. To find whether given element is a member of list | |
| | ii. Inserting an element at a) beginning b) end c) desired position | |
| 7 | Write a PROLOG program on lists. | 02 |
| | i. Reversing a list. | |
| | ii. Finding the position of given element in the list | |
| | a) from beginning. | |
| | b) from end. | |
| | Implementation of Checkers/Tic-Tac-Toe Game using the following Algorithms (8 & 9) | |
| 8 | Min-max Algorithm | 04 |
| 9 | Alpha-beta pruning | 04 |
| 10 | Design an Expert System of your choice | 02 |

Suggested Case List: -NA-