**Issue 01:Rev No. 00 : Dt. 01/08/22 VishwakarmaInstituteofTechnology,Pune**

**FFNo. : 654**

**IT3218: ARTIFICIAL INTELLIGENCE**

**Course Prerequisites: Data structures, Computer programming**

**Course Objectives:**

**To make students**

**1**. familiar with basic principles of AI

2. capable of using heuristic searches

3. aware of knowledge based systems

4. able to use fuzzy logic and neural networks

5. Learn various applications domains AI

**Credits: 4 Teaching Scheme Theory: 2** Hours/Week

**Tut**: 1 Hour/Week **Lab: 2** Hours/Week

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| **Course Relevance:** This course is highly applied in many scientific and engineering disciplines  **SECTION I** | | | | | |
| **Topics and Contents**  **Fundamentals of Artificial Intelligence**  Introduction, A.I. Representation, Non-AI &AI Techniques, Representation of Knowledge, KnowledgeBase Systems, State Space Search, Production Systems, ProblemCharacteristics, types of production systems, Intelligent Agents and Environments, concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation  **Uninformed Search Strategies**  Formulation of real world problems, Breadth First Search, Depth First Search, Depth Limited Search, Iterative Deepening Depth First Search, Bidirectional Search, and Comparison of Uninformed search Strategies.  **Informed Search Strategies**  Generate& test, Hill Climbing, Best First Search, A\*, Game playing: Minimax Search, Alpha-Beta Cutoffs, Waiting for Quiescence | | | | | |
| ***Knowledge Representation***  *Knowledge based agents, Wumpus world. Propositional Logic: Representation, Inference, Reasoning Patterns, Resolution, Forward and Backward Chaining.First order*  *Logic: Representation, Inference, Reasoning Patterns, Resolution, Forwardand Backward* | | | | | |
| **Introduction to PROLOG and ANN**  AI Programming Language (PROLOG): Introduction, How Prolog works?Some hands on PROLOG examples.  Introduction to Neural networks:- basics, comparison of human brain and machine, biological neuron, general neuron model, activation functions, Perceptron learning rule, applications and advantages of neural networks. Brief introduction to single layer and multiplayer networks.  **Handling Uncertainty**  Non Monotonic Reasoning, Logics for Non Monotonic Reasoning, Semantic Nets, Statistical Reasoning, Fuzzy logic: fuzzy set definition and types, membership function, designing a fuzzy set for a given application. | | | | | |
| **List of Practical’s: (Any Six)**  1. Implement Non-AI and AI Techniques  2. Implement any one Technique from the following  a. Best First Search OR A\* algorithm  b. Hill Climbing  3. Implement Perceptron learning algorithm  4. Implement a real life application in Prolog.  5. Expert System in Prolog-new application  6. Implement any two Player game using min-max search algorithm.  7. Design a fuzzy set for shape matching of handwritten character  8. Conducting Turing test of an online  **List of course Projects: (Any project within following domain but not limited to)**  1.Pattern recognition –Classification, Clustering, hybrid-classification clustering  2. Prediction using -Regression –Linear or nonlinear  3. Game playing- single player/2-player/multi-player  4. Use of Knowledge based system for generating inferences  5. Deep Learning  6. Neural network training and using for a real application  7. Use of fuzzy sets for human like reasoning  8. Use of any ML algorithm for solving real world problem  9. Deep Learning framework-PyTorch  10. Expert system applications in medicine suggestions  11. Some other projects mutually decided by instructor and students chat robot  9. Any real application of AI in gaming  10. Spam email detection and classification using any simple classifier  **Suggest an assessment Scheme:** | | | | | |
| Lab work | CP | ESE  written | CVV | Practical exam |  |
| 10 | 20 | 00 | 20 | 50 |  |
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**Text Books: (As per IEEE format)**

*1. Elaine Rich and Kevin Knight, Artificial Intelligence, 2nd, Ed., Tata McGraw Hill, 1991*

*2. Stuart Russell & Peter Norvig, Artificial Intelligence : A Modern Approach, 2nd, Ed., Pearson Education,2003*

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| **Reference Books: *(As per IEEE format)*** |
| *1. Ivan Bratko, Prolog Programming For Artificial Intelligence, 2nd Ed. Addison Wesley, 1986.*  *2. Eugene, Charniak, Drew Mcdermott, Introduction to Artificial Intelligence, Addison Wesley, 1985*  *3. Dan W Patterson, Introduction to AI and Expert Systems, PHI, 1990*  *4. Nils J. Nilsson, Principles of Artificial Intelligence, 1st Ed., Morgan Kaufmann,1982*  *5. Carl Townsend, Introduction to turbo Prolog, Paperback, 1987*  *6. Jacek M. Zurada, Introduction to artificial neural systems, Jaico Publication, 1994*  **Moocs Links and additional reading material:**  1. http://www.eecs.qmul.ac.uk/~mmh/AINotes/AINotes4.pdf  2. https://www.slideshare.net/JismyKJose/conceptual-dependency-70129647  3.https://web.archive.org/web/20150813153834/http://www.cs.berkeley.edu/~zadeh/papers/Fuzzy%20Sets-Information%20and%20Control-1965.pdf  4. https://www.youtube.com/watch?v=aircAruvnKk  5. https://www.youtube.com/watch?v=IHZwWFHWa-w  6. https://silp.iiita.ac.in/wp-content/uploads/PROLOG.pdf  7. Others suggested by instructor |

**Course Outcomes:**

Upon completion of the course, graduates will be able to -

1. Understand the basics of the theory and practice of Artificial Intelligence as a discipline and about intelligent agents capable of problem formulation.

2. Evaluation of different uninformed search algorithms on well formulated problems along with stating valid conclusions that the evaluation supports.

3. Design and Analysis of informed search algorithms on well formulated problems.

4. Formulate and solve given problem using Propositional and First order logic.

5. Apply neural network learning for solving AI problems

6. Apply reasoning for non-monotonic AI problems.