

|                              |                                                        |
|------------------------------|--------------------------------------------------------|
| <b>Branch Name:</b>          | Computer Engineering / Information Technology          |
| <b>Program Code:</b>         | ET103/ET105                                            |
| <b>Course Title:</b>         | Artificial Intelligence                                |
| <b>Course Code:</b>          | 2ET1030503T                                            |
| <b>Pre-requisite Course:</b> | Knowledge of Programming, Algorithms, Data Structures. |

**Course Objectives:**

- The field of AI and its techniques are being used in many areas which directly affect human life. Get insights into the basic knowledge of Artificial Intelligence, AI application along with its importance.
- 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, Genetic Algorithm, Neural Network and Connectionist Models are also important.
- Students should know some programming language for AI.

**Teaching and Examination Scheme:**

| Teaching and Examination Scheme: |                                   |   |   |       |                           |      |      |      |                   |      |      |      |                  |  |
|----------------------------------|-----------------------------------|---|---|-------|---------------------------|------|------|------|-------------------|------|------|------|------------------|--|
| Credit                           | Teaching Scheme<br>Hours per week |   |   |       | Evaluation Scheme (Marks) |      |      |      |                   |      |      |      |                  |  |
|                                  |                                   |   |   |       | Theory (Marks)            |      |      |      | Practical (Marks) |      |      |      | Total<br>(Marks) |  |
|                                  | L                                 | T | P | Total | SEE                       |      | CCA  |      | SEE               |      | CCA  |      |                  |  |
|                                  |                                   |   |   |       | Min.                      | Max. | Min. | Max. | Min.              | Max. | Min. | Max. |                  |  |
| 3                                | 3                                 | - | - | 3     | 24                        | 60   | 16   | 40   | -                 | -    | -    | -    | 100              |  |

**Course Contents:**

| Unit No | Topics                                                                                                                                                                                                                                                                                                                                                                                                     | Total Hours | Weightage (%) |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------|
| 1       | <b>AI Introduction and History:</b> Defining AI, Foundations of Artificial Intelligence. History of AI. AI Problems, Assumptions, Techniques, Level of Model, and Criteria for success. Problems, Problem spaces and Search - Problem Definition, Production systems, Problem characteristics, Production system characteristics.                                                                          | 05          | 10            |
| 2       | <b>Knowledge Representation:</b> Introduction, approaches to knowledge Representation, Knowledge Representation using Semantic Network, Knowledge Representation using Frames.<br><b>Probabilistic Reasoning:</b> Probability, inference using full joint distributions, Bayes rule, Bayesian networks representation, construction, exact and approximate inference, temporal model, hidden Markov model. | 07          | 20            |
| 3       | <b>Problem Solving:</b> Control strategies, Search strategies, Production system characteristics - Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing Depth first and Breadth first, Constraint's satisfaction Problem.                                                                                                    | 07          | 20            |
| 4       | <b>Game Playing-</b> The Minimax search procedure, Adding Alpha Beta cutoffs, Additional refinements. Planning- overview, The Blocks world, components of a planning system, Goal stack planning, Nonlinear planning and Hierarchical Planning.                                                                                                                                                            | 05          | 15            |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |    |    |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|
| 5 | <b>Introduction to Neural Network</b><br>Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference b/w ANN and human brain, characteristic and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Delta rule.<br>Introduction of MLP, Different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA. | 07 | 20 |
| 6 | <b>Genetic algorithm</b><br>Fundamental, basic concepts, working, principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods                                                                                                                                       | 05 | 15 |

**Reference Books:**

- Kevin Night and Elaine Rich, Nair B., 2008, “Artificial Intelligence (SIE)”, McGraw Hill.
- Dan W. Patterson, “Introduction to Artificial intelligence and expert system”, PHI, 3<sup>rd</sup> Edition, 2012.
- S. Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education
- David Poole, Alan Mackworth, Randy Goebel, “Computational Intelligence : a logical approach”, Oxford University Press.
- G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, Pearson Education.
- J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers
- S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication

**List of Open-Source Software/learning website:**

- <https://nptel.ac.in/courses/106105077>
- <https://nptel.ac.in/courses/106106126>
- <https://aima.cs.berkeley.edu>
- [https://ai.berkeley.edu/project\\_overview.html](https://ai.berkeley.edu/project_overview.html)
- <http://www.cs.cmu.edu/~tom/>
- <http://www.holehouse.org/mlclass/>

**Course Learning Outcomes (CLO):**

| Course Outcomes | Description                                                                          | Bloom's Taxonomy Level |
|-----------------|--------------------------------------------------------------------------------------|------------------------|
| COL1            | Understand the theory of Artificial intelligence                                     | Understand             |
| COL2            | Understand the Knowledge representation issues and concept learning                  | Understand             |
| COL3            | Apply decision tree learning and artificial neural networks.                         | Apply                  |
| COL4            | Apply Bayesian learning using bayes theorem, naive bayes classifier and EM Algorithm | Apply                  |
| COL5            | Understand the concepts of Game Theory                                               | Understand             |
| COL6            | Understated the fundamental of Genetic Algorithms                                    | Understand             |

**Mapping of CLO with PO and PSO :**

| Course Learning Outcomes | Program Outcomes (POs) |      |      |      |      |      |      |      |      |       |       |       | Program Specific Outcomes(PSOs) |      |
|--------------------------|------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|---------------------------------|------|
|                          | PO 1                   | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO1                            | PSO2 |
| <b>CLO1</b>              | M                      | M    | L    |      |      |      |      |      |      |       |       | L     | M                               | M    |
| <b>CLO2</b>              | M                      | M    | L    |      |      |      |      |      |      |       |       | L     | M                               | M    |
| <b>CLO3</b>              | M                      | M    | L    |      |      |      |      |      |      |       |       | L     | M                               | M    |
| <b>CLO4</b>              | M                      | M    | L    |      |      |      |      |      |      |       |       | L     | M                               | M    |
| <b>CLO5</b>              | M                      | M    | L    |      |      |      |      |      |      |       |       | L     | M                               | M    |
| <b>CLO6</b>              | M                      | M    | L    |      |      |      |      |      |      |       |       | L     | M                               | M    |

**H: High, M: Medium, L: Low**