## ARTIFICIAL INTELLIGENCE

### Programme Structure

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecture (L) Hours Per Week</th>
<th>Tutorial (T) Hours Per Week</th>
<th>Practical (P) Hours Per Week</th>
<th>Total Credits</th>
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<tbody>
<tr>
<td>CSE2351</td>
<td>Basics of Artificial Intelligence</td>
<td>3</td>
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<tr>
<td>CSE2451</td>
<td>Artificial Neural Networks</td>
<td>3</td>
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<td>CSE 2551</td>
<td>Fuzzy Logic</td>
<td>3</td>
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<tr>
<td>CSE2651</td>
<td>Introduction to Genetic Algorithm</td>
<td>3</td>
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<tr>
<td>CSE2751</td>
<td>Soft Computing</td>
<td>3</td>
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<tr>
<td>CSE2851</td>
<td>Project (Artificial Intelligence)</td>
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</table>
Course Code: CSE2351  Credit Units: 03

**Course Objective:**
To develop semantic-based and context-aware systems to acquire, organize process, share and use the knowledge embedded in multimedia content. Research will aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services. The field of Robotics is a multi disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

**MODULE- I**
AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

**MODULE-II**
Searching- Searching for solutions, uniormed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, A0* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

**MODULE-III**
Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye’s probabilistic interferences and dempstershafer theory.

**MODULE- IV**
First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation-based learning, Statistical Learning methods, Reinforcement Learning.

**MODULE- V**
Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty.
Examination Scheme:

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<th>Components</th>
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CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Reference Books:
2. David Poole, Alan Mackworth, Randy Goebel, ”Computational Intelligence : a logical approach”, Oxford University Press,
ARTIFICIAL NEURAL NETWORKS

Course Code: CSE2451  Credit Units: 03

Module-I
Artificial Neural Networks (ANN) and their biological roots and motivations. ANNs as numerical data/signal/image processing devices.a summing dendrite, synapses and their weights, pre- and post-synaptic signals, activation potential and activation function. Excitatory and inhibitory synapses. The biasing input. Types of activating functions. Encoding (training phase) and decoding (active phase). Taxonomy of neural networks: feedforward and recurrent networks with supervised and unsupervised learning laws, static &dynamic processing systems, basic data structures: mapping of vector spaces, clusters, principal components.

Module-II

Module-III

Module-IV

Module-V

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Reference Books:-
1. B. Yegnanarayana, Artificial Neural Networks, Prentice Hall of India.
2. Satish Kumar, Neural Networks – A Classroom Approach, Tata McGraw-Hill.
FUZZY LOGIC

Course Code: CSE2551  Credit Units: 03

MODULE- I
Introduction: Background, Uncertainty and imprecision, Statistics and random processes, Uncertainty in information, Fuzzy sets and membership, Chance versus ambiguity, Classical sets - operations on classical sets to functions, Fuzzy sets-fuzzy set operations, Properties of fuzzy sets, sets as points in hypercube.

MODULE-II

MODULE-III
Membership Functions: Features of the membership function, Standards forms and boundaries, fuzzification, Membership value assignments-intuition, Inference, Rank ordering, Angular fuzzy sets.

MODULE- IV

MODULE- V

MODULE- VI
Fuzzy Decision Making, Classification & Hybrid formation: Fuzzy synthetic evaluation, Fuzzy ordering, Preference and consensus, Multiobjective decision making under fuzzy states and fuzzy actions. Classification by equivalence relations-crisp relations, Fuzzy relations cluster analysis, neuro fuzzy and fuzzy genetic system, applications to engineering problems.

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Reference Books:-
- Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.
- Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
- Fuzzy Sets, Fuzzy Logic, and Fuzzy Systems by Lotfi A. Zadeh
- Fuzzy logic with engineering application by Timothy J. Ross-wiley
INTRODUCTION TO GENETIC ALGORITHM

Course Code: CSE2651 Credit Units: 03

Module-I

Module-II

Module-III
Genetic Algorithm in engineering and optimization—natural evolution—Simulated annealing and Tabu search—Genetic Algorithm in scientific models and theoretical foundations.

Module-IV
Introduction to genetics—based machine learning: Classifier system, Rule and Message system, Apportionment of credit, Knowledge based Techniques, Genetic Algorithms and parallel processors.

Module-V

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Text Book:
David E. Goldberg, "Genetic Algorithms in search, Optimization & Machine Learning"

Reference Books:
1. William B. Langdon, Riccardo Poli, "Foundations of Genetic Programming"
3. David A. Coley, "An Introduction to Genetic Algorithms for Scientists and Engineers"
SOFT COMPUTING

Course Code: CSE2751  Credit Units: 03

Module-I
Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Artificial Intelligence: Introduction, Various types of production systems, characteristics of production systems, breadth-first search, depth-first search techniques, other search techniques like hill climbing, Best first search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non-monotonic reasoning, forward reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.

Module-II
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. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA.

Module-III
Counter propagation network: - Architecture, functioning & characteristics of counter Propagation network, Hop field/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications.

Module-IV

Module-V
Genetic algorithm: 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.

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Reference Books:

- Bose, Neural Network fundamental with Graph, Algo.&Appl, TMH
- Kosko: Neural Network & Fuzzy System, PHI Publication
PROJECT (ARTIFICIAL INTELLIGENCE)

Course Code: CSE2851  Credit Units: 03

Methodology
Topics of project are to be based on the latest trends in Artificial Intelligence, verifying engineering concepts in Artificial Intelligence /principals and should involve elementary research work. The projects may involve design, fabrications, testing, computer modeling, and analysis of any engineering problem. On completion of the project, the students are to present a report covering various aspects learnt by them and give a presentation on same.

Examination Scheme:

<table>
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<tr>
<th>Component</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Literature study/ Fabrication/ Experimentation</td>
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<tr>
<td>Written Report</td>
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<tr>
<td>Viva</td>
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<td>Presentation</td>
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