4/4 B.Tech. FIRST SEMESTER

EE7T5B ARTIFICIAL INTELLIGENCE TECHNIQUES (ELECTIVE – I) Credits: 4

Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Objectives:
This course enables students to understand the concepts of artificial neural networks, fuzzy systems and their applications. This course also introduces students to genetic algorithms and artificial intelligent techniques.

Learning outcomes

- Upon completing this course students should be able to understanding the fundamentals of AI concepts and current issues. AI is the science that studies and develops methods of making computer more intelligent.
- Implementation of basic AI algorithms (like BPA, genetic algorithm etc). These are used in load forecasting, optimization problems
- Learn the knowledge representation and reasoning techniques in rule based system, case based systems and model based systems using neural networks and fuzzy logic and appreciate how uncertainity is being tackled in knowledge representation and reasoning process in fuzzy logic
- Master the skills and techniques in machine learning such as ANN, GA. This subject develops critically thinking skills.
- On developing alternative artificial techniques for real world problems (applications)

Unit I Fundamentals of Neural Networks
Basic concepts, Human Brain, Model of an artificial neuron, Architectures, Characteristics, Learning Methods, Taxonomy of NN architectures, History of NN research, early NN architectures.

Unit II Backpropogation Networks
Architecture – Perceptron model, Single layer ANN, Model for multilayer perceptron, Learning – Input, hidden and output layer computations, calculation of error, training of NN, method

Unit III AM and ART
Associative Memory - Autocorrelators, Heterocorrelators, Wang et al's Multiple Training Encoding Strategy, Exponential BAM, AM for real coded pattern pairs, recent trends; Adaptive Resonance Theory – Introduction, ART1, ART2, Sensitivities of ordering of data

Unit IV Fuzzy Set Theory
Fuzzy versus crisp, Crisp sets – operations, properties, partition and covering, Fuzzy sets - Membership function, Basic Fuzzy set operations, Properties of fuzzy sets, Crisp relations - Cartisian product, other crisp relations, operations on relations, Fuzzy Relations - Fuzzy Cartesian product, operations

Unit V Fuzzy Systems
Crisp Logic – Laws of propositional logic, inference in propositional logic, Predicate Logic – interpretations of predicate logic formula, inference in predicate logic, Fuzzy Logic – Fuzzy quantifiers, Fuzzy inference, Fuzzy Rule based System, Defuzzification Methods

Unit VI Fundamentals of Genetic algorithms

History, Basic concepts, Creation of offsprings, working principle, Encoding, Fitness function, Reproduction

Unit VII Genetic Modelling

Inheritance operators, Cross over, Inversion and Deletion, Mutation operator, Bit wise operators, Generational cycle, Convergence of Genetic algorithm, Multilevel optimization, Real life problem, Differences and similarities between GA and other traditional methods, advances in GA

Unit VIII Applications

GA based weight determination, Applications – Electrical load forecasting, Fuzzy logic controlled genetic algorithms – Soft computing tools, GA in Fuzzy logic controller design, FLC-GA based structural optimization

Learning resources

Text books:

1. "Neural Networks, Fuzzy Logic and Genetic Algorithms Synthesis and Applications" by S. Rajasekharan and G.A. Vijayalakshmi Pai, PHI publication.
2. "Introduction to Artificial Neural Systems" by Jacek M Zurada, Jaico Publishing House.

Reference books:

1. Foundations of Neural Networks, Fuzzy Systems and knowledge Engineering" by Nikola K . Kasabov, MIT Press, 1996.
2. Optimization for Engineering Design – Algorithms and Examples" by K.Deb, Pretice Hall of India, New Delhi.