ARTIFICIAL INTELLIGENCE TECHNIQUES (Common to PE&PS, PE, P&ID, PE&ED, PE&D, PE&S, EM&D) (Elective-II)

Prerequisites:

Basic knowledge on human biological systems, concept of optimization and electrical engineering.

Course Educational Objectives:

- To have knowledge on concept of neural network.
- To know different types of neural networks and training algorithms.
- To understand the concept of genetic algorithm and its application in optimization.
- To have the knowledge on fuzzy logic and design of fuzzy logic controllers.
- To know the applications of AI Techniques in power electronics and DC drives.

UNIT – 1:Introduction to Neural Networks

Introduction, Humans and Computers, Biological Neural Networks, Historical development of neural network, Terminology and Topology, Biological and artificial neuron models, Basic learning laws.

UNIT- 2:Feed Forward Neural Networks

Introduction, Perceptron models: Discrete, continuous and multi-category, Training algorithms: Discrete and Continuous Perceptron Networks, Perceptron convergence theorem, Limitations and applications of the Perceptron model, Generalized delta learning rule, Feed forward recall and error back propagation training-Radial basis function algorithms-Hope field networks

UNIT -3: Genetic algorithms & Modelling

Introduction-encoding-fitness function-reproduction operators-genetic operators-cross over and mutation-generational cycle-convergence of genetic algorithm

UNIT - 4: Classical and Fuzzy

Sets Introduction to classical sets - properties, operations and relations; Fuzzy sets, membership, Uncertainty, operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzy Logic System Components-Fuzzification, Membership value assignment, development of rule base and decision making system, defuzzification to crisp sets, defuzzification methods.

UNIT-5: Application of AI Techniques:

Design of PI controller for speed control of DC motor using neural networks and fuzzy logic-PWM Controllers -Selected harmonic elimination PWMSpace vector PWM using neural network.

Course Outcomes:

After completion of this course, students will be able to

- Understand neural networks and analyze different types of neural networks.
- Design training algorithms for neural networks.
- Develop algorithms using genetic algorithm for optimization.
- Analyze and designfuzzy logic systems.
- Apply AI Techniques in power electronics and DC drives.

Reference Books:

- 1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by RajasekharanandPai PHI Publication.
- 2. Introduction to Artificial Neural Systems Jacek M. Zuarda, Jaico Publishing House, 1997.
- 3. Modern Power Electronics and AC Drives –B.K.Bose-Pearson Publications Genetic Algorithms- David E Goldberg. Pearson publications.