III Year-II Semester		L	T	P	C
		3	**0**	**0**	**3**

NEURAL NETWORKS AND FUZZY LOGIC (R163025E)

Prerequisite Course:

Power System Analysis

Course Description and Objectives:

This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks. Also deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes.

Cos	Course Outcomes	POs
1	Know different models of artificial neuron.	3
2	Use learning methods of ANN.	3
3	Use different paradigms of ANN.	2
4	Classify between classical and fuzzy sets.	1
5	Use different modules of Fuzzy logic controller.	3
6	Apply Neural Networks and fuzzy logic for real-time applications.	

Syllabus:

UNIT – I:

Objective: To understand artificial neuron models.
Introduction to Neural Networks
Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential, Applications of ANN.

UNIT- II: Essentials of Artificial Neural Networks
Objective: To understand learning methods of ANN.
Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANNArchitectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

UNIT–III:
Objective: To utilize different algorithms of ANN.
Multilayer feed forward Neural Networks
Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements, Radial Basis Function (RBF) Neural Network – Kohonen Self Organising feature Map (KSOM).
Associative Memories
Bidirectional Associative Memories (BAM)-Architecture of Hopfield Network: Discrete and

Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network, Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

UNIT – IV:
Objective: To distinguish between classical and fuzzy sets.
Classical & Fuzzy Sets
Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT V:
Objective: To understand different modules of fuzzy controller.
Fuzzy Logic Modules
Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT VI:
Objective: To understand applications of neural networks and fuzzy logic.
Applications
Neural network applications: Process identification, control, fault diagnosis and load forecasting.
Fuzzy logic applications: Load frequency control and Fuzzy classification.

TEXT BOOKS:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications byRajasekharanandRai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi,S.N.Deepa, TMH,2006

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakins , Pearson Education
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.