

**IV Year I Semester**

**L T P C**

**Code: 17CS745**

**3 1 0 3**

**NEURAL NETWORKS & FUZZY LOGIC  
(Open Elective-I)**

**Course Objectives:**

The aim of Python Programming course is,

1. To understand artificial neuron models
2. To learning methods of ANN.
3. To utilize different algorithms of ANN.
4. To distinguish between classical and fuzzy sets.
5. To understand different modules of fuzzy controller.
6. To understand applications of neural networks and fuzzy logic.

**Course Outcomes:**

By the end of this course, the student is able to

- Know different models of artificial neuron.
- Use learning methods of ANN and
- Use different paradigms of ANN.
- Classify between classical and fuzzy sets.
- Use different modules of Fuzzy logic controller.
- Apply Neural Networks and fuzzy logic for real-time applications.

**Unit-I**

**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:** Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

**Unit-III**

**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**

**Classical & Fuzzy Sets:** Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

#### **Unit-V**

**Fuzzy Logic Modules:** Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

#### **Unit-VI**

**Neural network applications:** Process identification, control, fault diagnosis and load forecasting.

**Fuzzy logic applications:** Load frequency control and Fuzzy classification.

#### **Text Book:**

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

#### **Reference Book:**

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.