EE 555: SOFT COMPUTING LAB   (0-0-2:1)

Introduction to Soft Computing

Introduction, importance, main components, Fuzzy Logic, ANN, Evolutionary Algorithms, Hybrid Intelligent Systems.

Artificial Neural Network and Supervised Learning

Introduction, Comparison of Neural Techniques and AI, Artificial Neuron Structure, Adaline, ANN Learning, Back-Propagation Learning, Properties & Limitations.

Development of Generalized Neuron and Its Validation

Existing Neuron Model, Development, Advantages, Learning Algorithm of a Summation Type Generalized Neuron,   Benchmark Testing of Generalized Neuron Model, Generalization of GN model, Discussion.

Applications of Generalized Neuron Models

Application Electrical Machine Modeling, Electrical Load Forecasting Problem, Load Frequency Control Problem, Power System Stabilizer Problem, Aircraft Landing Control System.

Introduction to Fuzzy Set Theoretic Approach

Introduction, Uncertainty and Information., Types of Uncertainty, Fuzzy Logic- Introduction, development, Precision and Significance, set, Operations,   Union Intersection, Complement, Combination, Concentration, Dilation, Intensification, α-Cuts. Quantifier/Modifier/Hedges, Characteristics, Normality, Convexity, Cross Over Point, Single tone, Height, Cardinality,   Properties of Fuzzy Sets, Fuzzy Cartesian Product, shape & defining Membership Functions, Defuzzification, Rule Based System.

Applications of Fuzzy Rule Based System

Introduction, Modeling and Simulation, approach, selection, Steady State D.C. Machine Model, Control Applications-   Adaptive Control, PID Control System, Transient Model of D.C. Machine, Fuzzy Control System, Power System Stabilizer Using Fuzzy Logic.

Genetic Algorithms

Introduction, Genetic Algorithms, Effect of Crossover Probability on GA Performance, Effect of Mutation Probability on GA Performance, Main Components of GA, Variants, Applications of Genetic Algorithms in Load Forecasting, Development of Improved Genetic Algorithm (IGM), Application of Improved Genetic Algorithm (IGA) to Electrical Load Forecasting Problem .

Integration of Neural Networks and Fuzzy Systems

Adaptive Neuro-Fuzzy Inference Systems, HIV/AIDS Population Model Using Neuro-Fuzzy, Neuro-Fuzzy Approach of Modeling.

ANN – GA-Fuzzy Synergism and Its Applications

Training of ANN, ANN Learning Using GA, Validation and Verification of ANN-GA Model.

Text Books & References

1. S N Sivanandam, S.N. Deepa, "Principles of Soft Computing", Wiley.

2. D K Chaturvedi, "Soft Computing - Techniques and its Applications in Electrical Engineering", Springer-Verlag Berlin Heidelberg.