Soft Computing
IT703B
Contracts: 3L
Credits- 3

Module-I [2L]
Introduction:
Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm.

Module-II [10L]
Fuzzy sets and Fuzzy logic systems:
Classical Sets and Fuzzy Sets and Fuzzy relations : Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations.
Membership functions : Features of membership functions, standard forms and boundaries, different fuzzification methods.
Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods.
Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication
Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system - Aggregation of fuzzy Rules, Fuzzy Inference System- Mamdani Fuzzy Models - Sugeno Fuzzy Models.
Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting

Module-III [10L]
Neural Network
Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron.
Learning Methods : Hebbian, competitive, Boltzman etc.,
Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back-propagation and multi layer networks.
Competitive learning networks: Kohonen self organizing networks, Hebbian learning; Hopfield Networks.
Neuo-Fuzzy modelling:
Applications of Neural Networks: Pattern Recognition and classification

Module-IV [10L]
Genetic Algorithms: Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA).
Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition

Module-V [4L]
Other Soft Computing techniques: Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).

Text Books:
1. Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI
3. Principles of Soft Computing , S N Sivanandam, S. Sumathi, John Wiley & Sons
4. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
5. Neuro-Fuzzy and Soft computing, Jang, Sun, Mizutani, PHI
6. Neural Networks: A Classroom Approach,1/e by Kumar Satish, TMH,
7. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg, Pearson/PHI
8. A beginners approach to Soft Computing, Samir Roy & Udit Chakraborty, Pearson

Reference Books:
1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, George J. Klir and Bo Yuan, Prentice Hall
2. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.