

# GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: III

Computer Science & Engineering

Subject Name **Major Elective IV-Soft Computing**

Sr. No	Course content
1.	<b>Introduction:</b> What is Soft computing? Necessity of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.
2.	<b>Evolutionary Computing:</b> Basic Concepts of Genetic Algorithms (GA), Working Principle, Encoding methods, Fitness function, GA Operators- Reproduction; Crossover; Mutation, Convergence of GA, Multi-level Optimization, Real Life Problems.
3.	<b>Fuzzy Systems:</b> Fuzzy Set theory, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification, Fuzzy Logic, Fuzzy Rule based systems, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.
4.	<b>Neural Networks:</b> Basic Concept of Neural Network, Overview of Learning rules and activation functions, Single layer Perceptrons and Learning, Back Propagation networks- Architecture of Backpropagation(BP) Networks; Backpropagation Learning; Variation of Standard Backpropagation Neural Network, Introduction to Associative Memory, Adaptive Resonance Theory and Self Organizing Map, Recent Applications.
5.	<b>Hybrid Systems:</b> Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.
6.	<b>Evolutionary Design of Neural Networks:</b> Genetic Algorithm (GA) based Back propagation Networks, GA based weight determination, Fitness function, Reproduction, Convergence, and Recent Applications.
7.	<b>Fuzzy Evolutionary Algorithms:</b> Introduction, Fuzzy control of Evolution, Evolutionary Algorithms with Fuzzy components, GA in Fuzzy Logic Controller, Recent Applications.
8.	<b>Neural Network Based Fuzzy Systems:</b> Neural Realization of Basic Fuzzy Logic Operators, Neural Network Based Fuzzy Logic Inference, Neural Network Driven Fuzzy Reasoning, Rule based Neural Fuzzy Modeling, Neural Fuzzy Relational Systems, Neuro-Fuzzy Controllers, Recent Applications.

9.	<b>Fuzzy Logic Based Neural Network Models:</b> Fuzzy Neurons, Fuzzy Perceptrons, Fuzzy Neural Networks, Fuzzy Backpropagation (BP) Networks, Fuzzy BP architecture, Learning in Fuzzy BP, Inference by Fuzzy BP, Fuzzy ARTMAP, Fuzzy Associative Memories, Recent Applications.
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### **Reference Books:**

1. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S. Rajasekaran, G. A. Vijayalakshami, PHI.
2. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI
3. Fuzzy Logic and Engineering Application, Tomthy Ross, TMH
4. Elements of Artificial Neural Network, Kishan Mehrotra,
5. Genetic Algorithms: Search and Optimization, E. Goldberg.