**MCPE2007 Soft Computing (3-0-0)**

**Course Objectives:**

1. To introduce the fundamental concepts of Soft Computing Techniques.
2. To understand the feasibility of applying a soft computing methodology for a particular problem.
3. To develop and understanding of Neural Networks, Fuzzy System and Genetic Algorithm.
4. To explore advanced topics such as Hybrid systems, GA based Backpropagation Networks and Fuzzy Backpropagation Networks.

**MODULE - I**

**Introduction:**

What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.**Neural Networks:**What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons, Back Propagation networks, Architecture of Backpropagation(BP) Networks, Backpropagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

**MODULE - II**

**Fuzzy Systems:**Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification. **Genetic Algorithm:** History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

**MODULE - III**

**Hybrid Systems:**

Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

**MODULE - IV**

**GA based Backpropagation Networks:**GA based Weight Determination, K - factor determination in Columns, **Fuzzy Backpropagation Networks:**LR type Fuzzy numbers, Fuzzy Neuron, Fuzzy BP Architecture, Learning in Fuzzy BP, Application of Fuzzy BP Networks.

**Course Outcomes: Upon successful completion of this course, students should be able to:**

CO1: Apply the techniques of soft computing and foster their abilities in designing and implementing soft computing-based solutions for real-world engineering problems.

CO2: Analyze neural networks to pattern recognition, classification and regression problems to evaluate solutions by various soft computing approaches.

CO3: Apply and design fuzzy logic and reasoning to handle uncertainty and solve engineering problems.

CO4: Examine and formulate genetic algorithm to combinatorial optimization problems

**Text Book:**

1. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.

**Reference Books:**

1. Genetic Algorithms: Search and Optimization, E. Goldberg.
2. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI.