MCA 417: Advanced Soft Computing	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	**Examination Scheme** Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Pre-requisites: Mathematics, Algorithm, Programming skills.

Course Objectives:

3. Explain basic concepts, principles, algorithms, and performance metrics of soft computing;
4. Analyze computing requirements of a computing problem to be solved using soft computing algorithm.

Detailed Syllabus :

Unit-1 Fuzzy Set Theory: Introduction to Neuro–Fuzzy and Soft Computing, Fuzzy Sets – Basic Definition and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules – Extension Principle and Fuzzy Relations, Fuzzy IF-THEN Rules, Fuzzy Reasoning – Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling.
Unit-2 Optimization: Derivative-based Optimization, Descent Methods – The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization.
Unit-3 Genetic Algorithm: Simple Genetic Algorithms, Simulated Annealing, Gradient Free Optimization, Crossover and mutation, Genetic algorithms in search and optimization, Random Search, Downhill Simplex Search.
Unit-4 Neural Networks: Introduction, Architecture, Back Propagation and Feed Forward Networks, Supervised Learning Neural Networks, Perceptrons, Adline, BackpropagationMutilayerPerceptrons, Radical Basis Function Networks, Unsupervised Learning Neural Networks, Competitive Learning Networks, Kohonen Self-Organizing Networks, Learning Vector Quantization, Hebbian Learning.
Unit-5 Neuro Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems, Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN, Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum.
Unit-6 Applications: Pattern Recognitions, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Image Processing, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing
Text and Reference Books 1. Neuro-Fuzzy and Soft Computing", J.S.R.Jang, C.T.Sun and E.Mizutani, PHI - Pearson Education, 2004. 2. Fuzzy Logic with Engineering Applications", Timothy J.Ross, McGraw-Hill, 1997. **3.** Genetic Algorithms: Search, Optimization and Machine Learning", Davis E. Goldberg, Addison Wesley, N.Y., 1989.

Course Outcomes:

After completing the course, students will be able to:

1. Illustrate Fuzzy logic and its applications.
2. Artificial neural networks and its applications.
3. Solving single-objective optimization problems using GAs.
4. Solving multi-objective optimization problems using Evolutionary algorithms (MOEAs).
5. Applications of Soft computing to solve problems in varieties of application domains.
6. Fuzzy logic and its applications.