III Year MCA I Semester

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MC317   SOFT COMPUTING
ELECTIVE– IV

Objective of the Course::

- *This course will introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience. It also makes the students familiar with neural networks through examples and generalizes to form appropriate rules for inference systems. It will also provide the mathematical background for carrying out the optimization associated with neural network learning. Genetic algorithms and other random search procedures are also covered in this course.*

UNIT - I   (10 Hrs)

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 and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning , Fuzzy Inference Systems - Mamdani Fuzzy Models, Sugeno Fuzzy Models and Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling.

UNIT - II   (10 Hrs)

Optimization: Derivative-based Optimization, Descent Methods, Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing, Random Search and Downhill Simplex Search.

UNIT - III   (12 Hrs)

Neural Networks: Supervised Learning Neural Networks, Perceptrons, Adaline, Backpropagation Mutilayer Perceptrons, Radial Basis Function Networks, Unsupervised Learning Neural Networks, Competitive Learning Networks, Kohonen Self-Organizing Networks, Learning Vector Quantization, Hebbian Learning.

UNIT - IV   (15 Hrs)

Neuro Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN, Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks and Neuro Fuzzy Spectrum.

UNIT - V   **(13 Hrs)**

Applications of Computational Intelligence: Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction and Soft Computing for Color Recipe Prediction.

Text Books:
1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
5. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.