(IT611) SOFT COMPUTING (ELECTIVE - I)

Objective of the Course :

To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience. To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems. To provide the mathematical background for carrying out the optimization associated with neural network learning. To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations. To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing

UNIT - I

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 – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling

UNIT - II

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

UNIT - III

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

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 - V

Applications of COmputational Intelligence : Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction

TEXT BOOK :

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", 1st ed., PHI, Pearson Education, 2004.

REFERENCES BOOKS :

- 1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", 2nd ed., McGraw-Hill, 1997.
- 2. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", 1st ed., Addison Wesley, N.Y., 1989.
- 3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", 1st ed., PHI, 2003.
- 4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence PC Tools", 1st ed., AP Professional, Boston, 1996.