Soft Computing
CSE-803E

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UNIT I

Soft Computing: Introduction, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation, Operations.

UNIT II

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Fuzzy Proposition: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Fuzzy Decision Making, Fuzzy Control Systems. Fuzzyfications & Defuzzificataions, Applications of fuzzy logic, Industrial applications.

UNIT III

Neural Networks: History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, unsupervised and reinforcement Learning, ANN training Algorithms perceptions, Training rules, Delta Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

UNIT IV

Genetic Algorithm: Concept of Genetics and Evolution and its application to probabilistic search techniques. Basic GA framework and different GA architectures. GA operators: Encoding, Crossover, Selection, Mutation, etc. Solving single-objective optimization problems using GAs.

UNIT V

Introduction of Hybrid Systems: Neuro-Fuzzy Hybrid Systems, Genetic Neuro Hybrid Systems, Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Systems.

Applications: Medicine, Economics etc.

Text Books:

1. J.S.R.Jang, C.T. Sun And E.Mizutani, "Neuro-Fuzzy And Soft Computing", PHI / Pearson Education 2004.
2. S.N.Sivanandam & S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.
3. F. O. Karray and C. de Silva, "Soft computing & Intelligent System Design", Pearson, 2009.

Reference Books:

1. S.Rajasekaran & G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic And Genetic Algorithm: Synthesis & Applications", Prentice-Hall Of India Pvt. Ltd., 2006.
2. Freeman J.A. & D.M. Skapura, "Neural Networks: Algorithms, Applications and Programming Techniques", Addison Wesley, Reading, Mass, 1992.
3. S. Haykin. "Neural Networks-A Comprehensive Foundations", Prentice-Hall Int., 1999.