Soft Computing

Course Code: UCST0O008T

Course Title: Soft Computing

Semester: 1

Credits: 04

Rationale

Soft computing provides an approach to problem-solving using means other than comp[...]
With the human mind as a role model, soft computing is tolerant of partial truths, uncert[...]
imprecision and approximation, unlike traditional computing models. The tolerance of [...]
computing allows researchers to approach some problems that traditional computing [...]
process.

Course Outlines

Contents	No of Lectures
Unit-I Soft Computing: Introduction, soft computing vs. hard computing, various types of soft computing techniques, Applications of soft computing techniques, Introduction, Structure and function of a neuron, Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural networks, Difference between ANN and human brain, Characteristics and applications of ANN.	10
Unit-II Learning rules, Thresholds and activation functions, Single layer network, Perceptron and its training algorithm, Linear Separability, XOR problem, ADALINE, MADALINE, Introduction to multilayer layer Perceptron, Back propagation neural(BPN) networks.	10
Unit-III Counter propagation network, Hopfield/Recurrent network, Associative memory, Hopfield v/s Boltzman machine, competitive learning, Kohonen's self organizing networks, Adaptive Resonance Theory(ART).	10
Unit-IV 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. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations	10

on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy Logic: FIS, Fuzzification and de-Fuzzification.	
Unit-V Genetic algorithms(GA): Basic concepts, Conventional Vs. GA, Simple, GA working, encoding, fitness function, reproduction, Selection, crossover, mutation, schema analysis, analysis of selection algorithms, convergence, Reproduction, Crossover, and mutation, Mapping objective functions to fitness form, Fitness scaling. Meta-heuristic search: Overview of ACO, PCO.	10

Course Outcomes

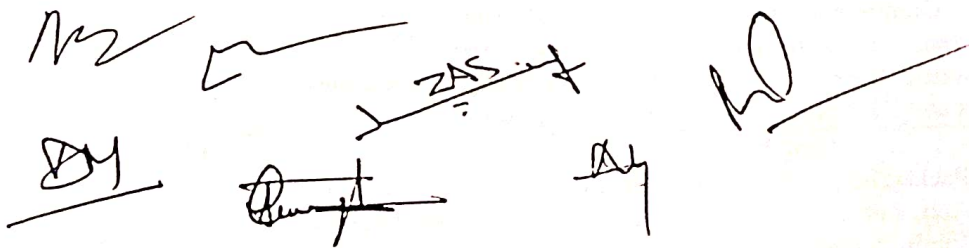Upon successful completion of this course, candidates will be able to:
- Identify and describe soft computing techniques and their roles in building intelligent machines.
- Apply genetic algorithms to combinatorial optimization problems.
- Evaluate and compare solutions by various soft computing approaches for a given problem.
- Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.

Text Books

1. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication.
2. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications.

Reference Books

1. Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.
2. Bose, Neural Network fundamental with Graph, Algo.& Appl, TMH.
3. Kosko: Neural Network & Fuzzy System, PHI Publication.
4. Klir & Yuan, Fuzzy sets & Fuzzy Logic: Theory & Appli., PHI Pub.
5. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y 2010.