SOFT COMPUTING
(ELECTIVE-I)

Course Code: 13IT2106

L	P	C
4	0	3

Course Educational Objectives:

The main objective of the course is to expose the students to soft computing, various types of soft computing techniques, and applications of soft computing. .Upon completion of this course, the student should be able to get an idea on :

1. Artificial Intelligence, Various types of production systems, characteristics of production systems.
2. Neural Networks, architecture, functions and various algorithms involved.
3. Fuzzy Logic, Various fuzzy systems and their functions.
4. Genetic algorithms, its applications and advances.

Course Outcomes:

At the end of the course the student should be able to

1. Learn about soft computing techniques and their applications
2. Analyze various neural network architectures
3. Understand perceptrons and counter propagation networks.
4. Define the fuzzy systems
5. Analyze the genetic algorithms and their applications.

Unit –I

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

Artificial Intelligence: Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.

Unit –II

Neural Network: Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference b/w ANN and human brain, characteristic and applications of ANN, single layer network.

Unit – III

Perceptron: Perceptron training algorithm, Linear separability , Widrow & Hebb's learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA.

Counter propagation network: architecture , functioning & characteristics of counter Propagation network, Hop field/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications. Hopfield v/s Boltzman machine. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.

Unit – IV

Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions.

Fuzzy rule base system : Fuzzy propositions, formation, decomposition & aggregation of fuzzy Rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.

Unit – V

Genetic algorithm: Fundamental, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator ,Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

Text Books:

1. S.N. Sivanandam & S.N. Deepa, *Principles of Soft Computing*, Wiley Publications, 2nd Edition, 2011.
2. S, Rajasekaran & G.A. Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications*, PHI Publication, 1st Edition, 2009.

References:

1. N.K.Bose, Ping Liang, *Neural Network fundamental with Graph, Algorithms & Applications*, TMH, 1st Edition, 1998.
2. Bart Kosko, *Neural Network & Fuzzy System*, PHI Publication, 1st Edition, 2009.
3. Rich E, Knight K, *Artificial Intelligence*, TMH, 3rd Edition, 2012.
4. George J Klir, Bo Yuan, *Fuzzy sets & Fuzzy Logic,*Theory & Applications, PHI Publication, 1st Edition, 2009.
5. Martin T Hagen, *Neural Network Design*, Nelson Candad, 2nd Edition, 2008.

Web references:

www.myreaders.info/html/soft_computing.html