CA5T3B   **SOFT COMPUTING**   **Credits : 4**

Lecture Hours : 4 periods / week   Internal assessment : 30   Marks

                                              Semester and Examination: 70   Marks

Course Description:

      Soft Computing Techniques(Artificial Neural Networks, Genetic Algorithms, Fuzzy Logic Models) have been recognized as attractive alternatives to the standard, well established "hard computing" paradigms. Traditional hard computing methods are often too cumbersome for today's problems. They always require a precisely stated analytical model and often a lot of computational time. Soft computing techniques, which emphasize gains in understanding system behavior in exchange for unnecessary precision, have proved to be important practical tools for many contemporary problems. NNs and FLMs are universal approximators of any multivariate function because they can be used for modeling highly nonlinear, unknown, or partially known complex systems, plants, or processes. Genetic Algorithm is a potential and robust optimization tool in recent years.

Course Objectives:

* To familiarize with soft computing concepts.
* To introduce the ideas of neural networks, fuzzy logic and use of heuristics based on human experience.
* To introduce the concepts of Genetic algorithm and its applications to soft computing using some applications.

Unit - I:

Soft Computing: Introduction, Fuzzy Computing, Neural Computing,
Genetic Algorithms, Applications.

Unit - II:

Fundamental of Neural Networks: Introduction, Models of Artificial Neuron, Architectures, Learning Methods, Taxonomy of Neural Networks, Single Layer Neural Networks, Applications.

Unit – III:

Multilayer Neural Networks: Introduction, Multilayer NN Architecure, Back-propagation Learning, Back-Propagation Algorithm, Applications.

UNIT – IV:

Associative Memory Models: Supervised and Unsupervised Learning models, Competitive Learning, Stability-Plastcity Dilemma (SPD), ART Networks, Iterative Clustering, ART Clustering.

UNIT –V:

Fuzzy Set Theory: Introduction, Fuzzy Set theory, Memberships, Opertions, Properties, Fuzzy Relations.

UNIT – VI:

Fuzzy Systems: Introduction, Fuzzy Logic, Fuzzification, Fuzzy Inference, Fuzzy Rule Based System, Defuzzification.

UNIT – VII:

Genetic Algorithms: Introduction, Encoding, Operators of Genetic Algorithm, Basic Structure of Genetic Algorithm, Illustration, Genetic Programming, Applications.

UNIT VIII:

Hybrid Systems: Integration of Neural Networks, Fuzzy Logic, and Genetic Algorithms, Genetic Algorithm Based Back-Propagation Networks, Fuzzy Back-Propagation Networks, Fuzzy Associative Memories, Fuzzy ARTMAP

Learning Resources :

Text Books:

1. Neural Network, Fuzzy Logic, and Genetic Algorithms - Synthesis and Applications, S. Rajasekaran and G.A. Vijayalaksmi Pai, Prentice Hall, 2005.
2. Soft Computing and Its Applications, R. A. Aliev, R. A. Aliev, World Scientific Publications, 2001.
3. Principles of Soft Computing, S. N. Sivanandam, S. N. Deepa, 2nd edition, Wiley-India, 2011.

Reference Books:

1. Soft Computing and Intelligent Systems - Theory and Application, Naresh K. Sinha and Madan M. Gupta, Academic Press, 2000.
2. Soft Computing and Intelligent Systems Design - Theory, Tools and Applications, by Fakhreddine karray and Clarence de Silva, Addison Wesley,2004.
3. Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, J. S. R. Jang, C. T. Sun, and E. Mizutani, Prentice Hall, 1996.
4. Soft Computing : Integrating Evolutionary, Neural, and Fuzzy Systems, by Tettamanzi, Andrea, Tomassini, and Marco., Springer, 2001.