SOFT COMPUTING

II Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB12	Core	3	-	-	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The course empowers students to leverage soft computing techniques for decision-making systems. They will learn to apply methods such as fuzzy logic, genetic algorithms, and neural networks to solve complex problems and make informed decisions. By utilizing these flexible and robust approaches, students will gain the ability to handle real-world complexities where precise mathematical modeling is challenging or impractical.

II. OBJECTIVES:

The students will try to learn:

I. Different soft computing concepts.
II. The supervised learning and unsupervised learning networks.
III. The ideas of neural networks, fuzzy logic.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Recognize** the importance of knowledge representation and processing in intelligent system.	Understand
CO 2	**Describe** the characteristics and constitutes of soft computing for decision making systems.	Understand
CO 3	**Demonstrate** the models of artificial neural systems or classification problems.	Apply
CO 4	**Apply** the learning rules and its working principle for computer vision and image processing applications.	Understand
CO 5	**Compare** he importance of auto and hetero associative memories for distinct cases of neural network systems.	Create

IV. SYLLABUS

UNIT-I	**INTRODUCTION TO NEURAL NETWORKS**	**Classes: 09**

Introduction: Fundamental concept, evolution of neural networks, models of artificial neural networks, important technologies, applications, McCulloch, Pitts Neuron, linear separability, Hebb network; Supervised learning network: Perception networks, adaptive linear neuron, multiple adaptive linear neurons, back propagation network, radial basis function network.

UNIT-II	**ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS**	**Classes: 09**

Associative memory networks: Training algorithms for pattern association, auto associative memory network, hetero associative memory network, bidirectional associative memory, Hopfield networks, iterative auto associative memory network, temporal associative memory network; Unsupervised learning networks: Kohonenself-organizing feature maps, learning vector quantization, counter propagation networks, adaptive resonance theory network.

UNIT-III	**FUZZY LOGIC**	**Classes: 09**

Fuzzy logic: Introduction to classical/crisp sets and fuzzy sets, classical/crisp relations and fuzzy relations, tolerance and equivalence relations, non-iterative fuzzysets.

Membership functions: Fuzzification, methods of membership value assignments, defuzzification, and Lambda cuts for fuzzy sets and fuzzy relations, defuzzification methods.

UNIT-IV	**FUZZY ARITHMETIC**	**Classes: 09**

Fuzzy arithmetic and fuzzy measures: Fuzzy rule base and approximate reasoning, truth values and tables in fuzzy logic, fuzzy propositions, formation of rules, decomposition and aggregation of rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making, fuzzy logic control systems, fuzzy expert systems.

UNIT-V	**GENETIC ALGORITHMS**	**Classes: 09**

Genetic algorithm and search space, general genetic algorithm, operators, generational cycle, stopping condition, constraints, classification, genetic programming, multilevel optimization; Applications: A fusion approach of multispectral images with SAR image for flood area analysis, optimization of travelling salesman problem using genetic algorithm approach, and genetic algorithm based internet search technique, soft computing based hybrid fuzzycontrollers.

Text Books:

1. J. S. R. Jang, C. T. Sun, E. Mizutani, Neuro, "Fuzzy and Soft Computing", PHI, Pearson Education, 1st Edition, 2004.
2. S. N. Sivanandan, S. N. Deepa, "Principles of Soft Computing", Wiley India, 2nd Edition, 2007.

Reference Books:

1. S. Rajasekaran, G. A. V. Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 1st Edition, 2003.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Mc Graw Hill, 3rd Edition, 1997.
3. Stamatios V. Kartalopoulos "Understanding Neural Networks and Fuzzy Logic Basic Concepts and Applications", IEEE Press, PHI, New Delhi, 2004.

Web References:

1. http://www.sctie.iitkgp.ernet.in/
2. http://www.rkala.in/softcomputingvideos.php
3. http://www.sharbani.org/home2/soft-computing-1
4. http://www.myreaders.info/html/soft_computing.html