SOFT COMPUTING

II Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSC14	Core	3	-	-	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

This course covers the basics of intelligence techniques and methodologies of soft computing that differs from conventional artificial computations. This course is used for approximate calculations to provide imprecise but useable solutions to complex problems. This course includes intelligence systems, artificial neural network models, fuzzy logic and its inference system, and neuro-fuzzy system. The applications are used in pattern recognition, image processing, computer vision and information retrieval.

II. COURSE OBJECTIVES:

The students will try to learn:

1. The fuzzy logic and reasoning for handling uncertainty in problem solving
2. Introduce the ideas of neural networks, fuzzy logic.
3. The basics of intelligence techniques and methodologies of soft computing
4. The design and analysis of problem-solving using concepts of neural networks, neuro modeling, several neural networks paradigms.

III. COURSE OUTCOMES:

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

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

IV. SYLLABUS:

MODULE-I: INTRODUCTION TO NEURAL NETWORKS (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.

MODULE-II: ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS (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.

MODULE-III: FUZZY LOGIC (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.

MODULE-IV: FUZZY ARITHMETIC (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.

MODULE-V: GENETIC ALGORITHMS (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 imagefor flood area analysis, optimization of travelling salesman problem using genetic algorithm approach, and genetic algorithm-based internet search technique, soft computing-based hybrid fuzzy controllers.

V. TEXT BOOKS:

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

VI. REFERENCE BOOKS:

1. S.Rajasekaran, G.A.V.Pai,"NeuralNetworks,FuzzyLogicandGeneticAlgorithms",PHI, 1st Edition,2003.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 3rd Edition, 1997.
3. StamatiosV.Kartalopoulos"UnderstandingNeuralNetworksandFuzzyLogicBasicConceptsand Applications", IEEE Press, PHI, New Delhi, 2004.

VII. 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

VIII E-Text Books:

1. https://www.books.google.co.in/books?id=bVbj9nhvHd4C
2. https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.