INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

SOFT COMPUTING							
I Semester: CSE							
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**	

Course Code	Category	L	T	P	C	CIA	SEE	Total
BCSE08	**Core**	3	-	-	3	40	60	100

Contact Classes:48	**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 differ 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 systems. The applications are used in pattern recognition, image processing, computer vision, and information retrieval.

II. COURSE OBJECTIVES:

The students will try to learn:
  I.   The fuzzy logic and reasoning for handling uncertainty in problem solving
  II. Introduce the ideas of neural networks, and fuzzy logic.
  III. The basics of intelligence techniques and methodologies of soft computing
  IV. The design and analysis of problem-solving using concepts of neural networks, neuro modeling,neural network 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
  CO 2 Describe the characteristics and constitutes of soft computing for decisionmaking systems.
  CO 3 Demonstrate the models of artificial neural systems for classificationproblems.
  CO 4 Apply the learning rules and its working principle for computer vision and image processing applications.
  CO 5 Compare the importance of auto and hetero associative memories for distinct cases of neural network systems.
  CO6   Construct the Genetic algorithm and search space, general genetic algorithms

IV. COURSE CONTENT:

MODULE-I: INTRODUCTION TO NEURAL NETWORKS (10)
Introduction: Fundamental concept, the 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, backpropagation 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: Kohonen self-organizing feature maps, learning vector quantization, counter propagation networks, adaptive resonance theory network.

MODULE-III: FUZZY LOGIC (10)
Fuzzy logic: Introduction to classical/crisp sets and fuzzy sets, classical/crisp relations and fuzzy relations, tolerance and equivalence relations, and non-iterative fuzzy sets.

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

MODULE-IV: FUZZY ARITHMETIC (10)
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 image for flood area analysis, optimization of traveling 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 and Soft Computing", 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,"Neural Networks, Fuzzy Logic and Genetic Algorithms",PHI, 1st edition, 2003.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 3rd edition, 1997.
3. StamatiosV.Kartalopoulos"Understanding Neural Networks and Fuzzy Logic Basic Concepts and 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. Mizut ani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.

IX. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open,Ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper, I
8. Model question paper, II
9. Lecture notes
10. Power Point presentation
11. E-Learning Readiness Videos (ELRV)