COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC360	Soft Computing	3-0-0 -3	2016

Prerequisite: NIL

Course objectives:

1. To familiarize various components of soft computing like fuzzy logic, neural networks and genetic algorithm.
2. To give an overview of fuzzy Logic and to understand the concepts and terminologies of fuzzy systems
3. To give a description on artificial neural networks with its advantages and application.
4. To study the fundamentals of Genetic Algorithm (GA).
5. To understand the concepts of hybrid systems.

Syllabus:

Fuzzy sets and systems. Neural Networks - Applications - typical architecture, pattern Classification and pattern Association. Fundamentals of Genetic Algorithm, AI search algorithm and hybrid structure.

Expected outcome:

The students will be able to:

1. Identify and describe soft computing techniques and their roles in building intelligent Machines.
2. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
3. Recognize the feasibility of applying a soft computing methodology for a particular Problem.
4. Apply neural networks to pattern classification and regression problems.
5. Apply genetic algorithms to combinatorial optimization problems

Text Books:

1. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley,N.Y, 1989.
2. Laurene V. Fausett, (1993) “Fundamentals of Neural Networks: Architecture, Algorithms and Applications", Prentice Hall.
3. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

References:

1. Ibrahim A. M., Introduction to Applied Fuzzy Electronics, PHI, 2013.
2. J. Yen and R. Langari, Fuzzy Logic, Intelligence, Control and Information, Pearson Education.
3. K.H.Lee, First Course on Fuzzy Theory and Applications, Springer-Verlag.
4. Lin C. T. and C.S. G. Lee, Neural Fuzzy Systems, Prentice Hall, 1996.
5. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India.
6. S.N. Sivanandan and S.N. Deepa, Principles of Soft Computing, Wiley India, 2007. ISBN: 10: 81-265-1075-7.

Course Plan			
Module	**Course content**	**Hours**	**End Sem. Exam Marks**
I	Soft computing: Introduction, soft computing vs hard computing, Fuzzy Computing, Neural Computing, Genetic Algorithms. applications of soft computing	2	**15**
	Introduction to fuzzy sets and systems-crispness, vagueness, uncertainty and fuzziness. Basics of fuzzy sets, membership functions, support of a fuzzy set height, normalized fuzzy set, alpha cuts.	3	
II	Type- 2 fuzzy sets. Operation on fuzzy set-complement, intersection, union, Demorgan's Law Equality & subset hood.	4	**15**
	Extension Principle and its application, Fuzzy relation-operations, projection, max-min, min-max composition, cylindrical extension.	3	
FIRST INTERNAL EXAM			
III	Reflexivity, symmetry and transitivity of fuzzy relations. Fuzzy prepositions, fuzzy connectives, linguistic variables, hedges.	4	**15**
	Approximate reasoning or fuzzy inference, Fuzzy rule based system. Fuzzification and defuzzification using centroid, centre of sums.	4	
IV	Introduction to Neural Networks - Applications –Biological neuron- Typical architecture of Artificial Neural Networks - Common activation function.	4	**15**
	McCulloh Pitts Neuron – Architecture, logic implementatons. Supervised and Unsupervised learning	4	
SECOND INTERNAL EXAM			
V	Linear Separability, Pattern Classification: Perceptrons	2	**20**
	Back propagation network and its architecture, Back propagation learning, back propagation algorithm	4	
VI	Genetic Algorithm Basic concepts, Initialization and selection, Survival of the Fittest - Fitness Computations.	5	**20**
	Operators - Cross over, Mutation.	3	
END SEMESTER EXAM			

Question Paper (End semester exam)

Max. Marks: 100 **Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with 50 % for theory, derivation, proof and 50% for logical/numerical problems.