COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC 367	Soft Computing	3-0-0 -3	2015

Prerequisite: NIL

Course objectives:

The purpose of this course is:

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:

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

Text Books:

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

References:

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

Course Plan			
Module	**Course content**	**Hours**	**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.	2	
	Type- 2 fuzzy sets. Operation on fuzzy set-complement, intersection, union, Demorgan's Law Equality & subset hood.	2	
II	Extension Principle and its application, Fuzzy relation-operations, projection, max-min, min-max composition, cylindrical extension.	2	**15**
	Reflexivity, symmetry and transitivity of fuzzy relations. Fuzzy prepositions, fuzzy connectives, linguistic variables, hedges.	3	
	Approximate reasoning or fuzzy inference, Fuzzy rule based system. Fuzzification and defuzzification using centroid, centre of sums.	3	
FIRST INTERNAL EXAM			
III	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	
IV	Linear Separability, Pattern Classification: Perceptrons	2	**15**
	Back propagation network and its architecture, Back propagation learning, back propagation algorithm	4	
SECOND INTERNAL EXAM			
V	Genetic Algorithm Basic concepts, Initialization and selection, Survival of the Fittest - Fitness Computations.	5	**20**
	Operators - Cross over, Mutation.	3	
VI	Introduction to Neural Fuzzy Controller	2	**20**
	Parameter learning for Neural fuzzy controllers – Neural Fuzzy controller with Fuzzy singleton Rules.	4	
END SEMESTER EXAM			

Question Paper Pattern

The question paper consists 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. Each question has a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is to be answered. Mark pattern is according to the syllabus with 50 % for theory, derivation, proof and 50% for logical/numerical problems.