Course No.	Course Name	L-T-P Credits	Year of Introduction
CS361	SOFT COMPUTING	3-0-0-3	2015

Course Objectives

To introduce the concepts in Soft Computing such as Artificial Neural Networks, Fuzzy logic-based systems, genetic algorithm-based systems and their hybrids.

Syllabus

Introduction to Soft Computing, Artificial Neural Networks, Fuzzy Logic and Fuzzy systems, Genetic Algorithms, hybrid systems.

Expected Outcome

Student is able to

1. *Learn about soft computing techniques and their applications.*
2. *Analyze various neural network architectures.*
3. *Define the fuzzy systems.*
4. *Understand the genetic algorithm concepts and their applications.*
5. *Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution.*

Text Books

1. S. N. Sivanandam and S. N.Deepa, Principles of soft computing - Wiley India.
2. Timothy J. Ross, Fuzzy Logic with engineering applications – Wiley India.

References

1. N. K. Sinha and M. M. Gupta, Soft Computing & Intelligent Systems: Theory & Applications-Academic Press / Elsevier. 2009.
2. Simon Haykin, Neural Network- A Comprehensive Foundation- Prentice Hall International, Inc.
3. R. Eberhart and Y. Shi, Computational Intelligence: Concepts to Implementation, Morgan Kaufman/Elsevier, 2007.
4. Ross T.J. , Fuzzy Logic with Engineering Applications- McGraw Hill.
5. Driankov D., Hellendoorn H. and Reinfrank M., An Introduction to Fuzzy Control-Narosa Pub.
6. Bart Kosko, Neural Network and Fuzzy Systems- Prentice Hall, Inc., Englewood Cliffs
7. Goldberg D.E., Genetic Algorithms in Search, Optimization, and Machine Learning-

Addison Wesley.			
Course Plan			
Module	Contents	Hours	Sem. Exam Marks %
I	Introduction to Soft Computing Artificial neural networks - biological neurons, Basic models of artificial neural networks – Connections, Learning, Activation Functions, McCulloch and Pitts Neuron, Hebb network.	08	15%
II	Perceptron networks – Learning rule – Training and testing algorithm, Adaptive Linear Neuron, Back propagation Network – Architecture, Training algorithm	08	15%
FIRST INTERNAL EXAM			
III	Fuzzy logic - fuzzy sets - properties - operations on fuzzy sets, fuzzy relations - operations on fuzzy relations	07	15%
IV	Fuzzy membership functions, fuzzification, Methods of membership value assignments – intuition – inference – rank ordering, Lambda –cuts for fuzzy sets, Defuzzification methods	07	15%
SECOND INTERNAL EXAM			
V	Truth values and Tables in Fuzzy Logic, Fuzzy propositions, Formation of fuzzy rules - Decomposition of rules – Aggregation of rules, Fuzzy Inference Systems - Mamdani and Sugeno types, Neuro-fuzzy hybrid systems – characteristics - classification	08	20%
VI	Introduction to genetic algorithm, operators in genetic algorithm - coding - selection - cross over – mutation, Stopping condition for genetic algorithm flow, Genetic-neuro hybrid systems, Genetic-Fuzzy rule based system	08	20%
END SEMESTER EXAMINATION			

Question Paper Pattern

1. There will be *five* parts in the question paper – A, B, C, D, E
2. Part A
    a. Total marks : 12
    b. *Four* questions each having 3 marks, uniformly covering modules I and II; All *four* questions have to be answered.
3. Part B
    a. Total marks : 18
    b. *Three* questions each having 9 marks, uniformly covering modules I and II; T*wo* questions have to be answered. Each question can have a maximum of three sub-parts
4. Part C
    a. Total marks : 12
    b. *Four* questions each having 3 marks, uniformly covering modules III and IV;All *four* questions have to be answered.
5. Part D
    a. Total marks : 18
    b. *Three* questions each having 9 marks, uniformly covering modules III and IV; *Two* questions have to be answered. Each question can have a maximum of three subparts
6. Part E
    a. Total Marks: 40
    b. *Six* questions each carrying 10 marks, uniformly covering modules V and VI; *four* questions have to be answered.
    c. A question can have a maximum of three sub-parts.
7. There should be at least 60% analytical/numerical/design questions.