



FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Technology

Semester I/II

Course Code: 102341203

Course Title: Soft Computing

Type of Course: Program Elective I/II/ Core Course IV

Course Objectives: The main objective of the course is to learn concepts and working of various soft computing techniques such as genetic algorithms, fuzzy logic and neural networks and apply them for various real-time engineering problems such as classification, optimizations, clustering and controls.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorials	Practicals		Internal		External		Total
				Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	30 / 15	20 / 10	70 / 35	30 / 15	150 / 75

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction to Soft Computing: Introduction, Soft Computing vs Hard computing, Soft computing characteristics, Constituents of soft computing, From conventional AI to Computational Intelligence	3
2	Fuzzy Set Theory, Fuzzy Logic and Fuzzy Reasoning: Introduction, Fuzzy Set and Fuzzy Logic, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Decision Making, Fuzzy Clustering, Fuzzy Expert System.	10
3	Genetic Algorithms: Introduction to Optimization, Basic Concepts of Genetic Algorithms (GA), Working principle, Encoding, Fitness function, Genetic Operators - Selection, Crossover, Mutation, Convergence of GA, Variants of GA, Multi-objective Optimizations with GA, Applications of GA	8
4	Neural Network: Introduction to machine learning with Neural Networks, Types of learning, Neural network architectures, Single layer networks, Multilayer networks with backpropagation learning, Radial basis function Networks, Unsupervised learning	12



	with Neural Networks, Advances in Neural Networks, Applications of neural networks, Overview of Reinforcement Learning	
5	Hybrid systems: Types of Hybridizations, Neuro-fuzzy systems, Neuro-genetic Systems, Fuzzy-genetic systems, Applications of hybrid systems	7

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	U	A	N	E	C	
20%	25%	15%	10%	20%	10%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1	Jyh Shing Roger Jang, Chuen Tsai Sun, Eiji Mizutani, Neuro-Fuzzy and Soft Computing, Prentice Hall of India, 2003
2	George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995
3	Timothy J. Ross, Fuzzy Logic with Engineering Applications
4	D.E.Goldberg, Genetic algorithm in search, optimization and machine learning, Addison-Wesley, Reading Mass
5	S.N.Sivanandam, S.N.Deepa, Principles of Soft Computing, Wiley India Pvt. Ltd.
6	Nikola K. Kasabov, Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering, MIT Press
7	D.K.Pratihar, Soft Computing. Narosa Publishing House
8	S.Rajasekaran, G.A.Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications. PHI

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understanding of different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their hybridizations.	20
CO-2	Ability to identify, analyze and apply suitable soft computing techniques to solve engineering or real life problems.	10
CO-3	Apply genetic algorithms for real-time search, optimization, and design problems	20
CO-4	Apply neural networks for pattern recognition and prediction tasks	25
CO-5	Apply fuzzy reasoning for real-time control systems	25

List of Practicals / Tutorials:

1	Implementation of Single layer networks
2	Implementation of Multilayer networks with Backpropagation algorithms
3	Use of neural networks for classification applications-1
4	Use of neural networks for classification applications-2
5	Use of neural networks for regression applications



6	Working with genetic algorithms
7	Using GA for various optimization problems
8	Design of Fuzzy control systems
9	Application development using Fuzzy control systems
10	Implementation of fuzzy C-means clustering
11	Study of hybrid systems

Supplementary learning Material:

1	https://nptel.ac.in/courses/106/105/106105173/
2	http://www.soft-computing.de/

Curriculum Revision:

Version:	1
Drafted on (Month-Year):	Sep-20
Last Reviewed on (Month-Year):	Sep-20
Next Review on (Month-Year):	Sep-20