C. U. SHAH UNIVERSITY – WADHWAN CITY

FACULTY OF TECHNOLOGY AND ENGINEERING
DEPARTMENT OF COMPUTER ENGINEERING
M. TECH. SEMESTER: - I

SUBJECT NAME: Soft Computing (SCP)
SUBJECT CODE: 5TE01SCP1

Teaching & Evaluation Scheme: -

Subject Code	Subject Name	Teaching Scheme (Hours)				Credit	Evaluation Scheme							
							Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
		Th	Tu	Pr	Total		Marks	Hours	Marks	Hours	Pr/Viva	TW	Pr	
5TE01SCP1	Soft Computing	4	0	2	6	5	30	1.5	70	3.0	-	20	30	150

Objectives:

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- To become familiar with neural networks concepts and to provide the mathematical background for carrying out the optimization associated with neural network learning
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.

Prerequisites:

- Basic awareness of artificial intelligence

Course outline:

Sr. No.	Course Contents
1	**Soft Computing:** Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing
2	**Artificial Intelligence:** Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non-monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & fillerstructures, NLP
3	**Fuzzy Set Theory:** Introduction to Neuro, Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani

	Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling
4	**Neural Networks:** Supervised Learning Neural Networks, Perceptrons, Adaline, Backpropagation Multilayer Perceptrons, Radial Basis Function Networks, Unsupervised Learning Neural Networks, Competitive Learning Networks, Kohonen Self-Organizing Networks, Learning Vector Quantization, Hebbian Learning
5	**Neuro Fuzzy Modeling:** Adaptive Neuro-Fuzzy Inference Systems, Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN, Coactive Neuro Fuzzy Modelling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum
6	**Genetic algorithm:** Fundamentals, basic concepts, working principle, encoding, fitnessfunction, reproduction, Genetic modelling: Inheritance operator, cross over, inversion & deletion,mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications &advances in GA, Differences & similarities between GA & other traditional method
7	**Applications of Computational Intelligence:** Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Colour Recipe Prediction

Learning Outcomes:
To introduce the techniques of soft computing and adaptive neuro-fuzzy inferencing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.

Books Recommended:

1. Neuro-Fuzzy and Soft Computing, **J.S.R.Jang, C.T.Sun and E.Mizutani**; Pearson Education (2004)
2. Fuzzy Logic with Engineering Applications, **Timothy J.Ross**; McGraw-Hill, 1997.
3. Genetic Algorithms: Search, Optimization and Machine Learning, **Davis E.Goldberg**; Addison Wesley, N.Y.(1989.)
4. Neural Networks, Fuzzy Logic and Genetic Algorithms, **S. Rajasekaran and G.A.V.Pai**; PHI (2003).
5. Fuzzy Logic, Intelligence, Control and Information, **J. Yen and R. Langari**; Pearson Education.
6. Artificial Intelligence, **Elaine Rich & Kevin Knight**; Second Edition, Tata Mcgraw Hill Publishing Comp., New Delhi (2006)