GUJARAT TECHNOLOGICAL UNIVERSITY
COMPUTER SCIENCE & ENGINEERING
B. E. SEMESTER: VII

Subject Name: **Soft Computing**
Subject Code: **173101**

Teaching Scheme				Evaluation Scheme			
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (E)**		**Mid Sem Exam (Theory) (M)**	**Practical (Internal)**
				Theory	**Practical**		
3	0	2	5	70	30	30	20

Sr. No.	Course Contents	Total Hrs
1.	**Neural Networks** Supervised Learning Neural Networks – Perceptrons - Adaline – Back propagation Multilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.	04
2.	**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.	08
3.	**Genetic Algorithm:** Difference between Traditional Algorithms and GA, The basic operators, Schema theorem, convergence analysis, stochastic models, applications in search and optimization. Encoding, Fitness Function, Reproduction, Cross Over, Mutation, Convergence Theory; Applications – Match Word Finding, Travelling Sales Man Problem.	08
4.	**Rough Set:** Indiscernibility Relations, Reducts, Rough Approximation. Applications. Hybrid Systems: Neuro Fuzzy Systems, Fuzzy Logic Controlled GA, Fuzzy Membership Interpretation using Rough Set theory etc.	06

5.	**Neuro Fuzzy Modeling** Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum. Neuro-Fuzzy Systems for Pattern Recognition: Image-, Speech- and Language Processing , Application - Speech Recognition	08
6.	**Neuro-Genetic Information Processing For Optimization**: Adaptation in Intelligent Systems, Evolving Connectionist and Fuzzy Connectionist Systems, Applications for Adaptive Systems, On-line Intelligent Systems, GA Based Weight Optimization.	06
7.	**Machine Learning** Learning form Examples - Inductive Concept Learning - Sequence Prediction - Effect of Noise in Input. Learning by Analogy- Concept formation - Derivational Analogy. Learning by Observation and Discovery - Search for Regularity- Conceptual Clustering, Computational Learning Theory.	08
8.	**Applications Of Computational Intelligence** Shortest Path Algorithm, Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction, Stock Marker Forecasting	06

Text Books:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. Michalski, Carbonnel & Michel (Eds.): Machine Learning - An A. I. Approach, Vol-I.
3. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
4. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
5. S Machine Learning by Tom. M Mitchell, McGrawHill International Edition, Computer Science Series.

Reference Books:

1. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
2. Neural network fuzzy logic genetic algorithm synthesis and application- S. RjaeshKaran.
3. Neuro-Fuzzy Techniques for Intelligent Information Systems by Nikola Kasabov and Robert Kozma (eds), ISBN 3-7908-1187-4.