C. U. SHAH UNIVERSITY
Wadhwan City

FACULTY OF: - Technology and Engineering
DEPARTMENT OF: - Electronics & Communication Engineering
SEMESTER: - VII
CODE: - **4TE07FNN1**
NAME: – **Fuzzy Logic and Neural Networks (FNN)**

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Credits	Evaluation Schemes							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
4TE07 FNN 1	Fuzzy Logic and Neural Networks (FNN)	03	00	02	05	04	30	1.5	70	3.0	---	20	30	150

Objectives:-

- In this course, student will study basic concepts of fuzzy logic and neural networks. Also they study fuzzy associative memories, fuzzy image transform coding, neuronal and synaptic dynamics.

Prerequisite:-

- Students should have basic knowledge about digital Electronics. The basic concepts of mathematics must be clear.

Course Outline:-

Sr. No.	Course Content	Hours
1	**Introduction to Fuzzy Systems**: Introduction, Fuzzy sets & logic back grounds	2
2	**Neural Networks & fuzzy systems:** Neural & Fuzzy machine intelligence, Fuzziness as Multivalence, the dynamical systems approach to machine intelligence, intelligent behaviour as adaptive model free estimation.	5
3	**Fuzziness versus probability and fuzzy associative memories**: Fuzzy sets & systems, fuzziness in probabilistic world, randomness v/s Ambiguity, the universe as fuzzy set, the geometry of fuzzy sets, the fuzzy entropy theorem, the subset hood theorem. the entropy sub-set hood theorem, fuzzy system as between cube mapping, fuzzy and neural function estimators, fuzzy Hebb FAMs, Adaptive FAMs.	10
4	**Comparison of fuzzy & Neural Network and fuzzy image transform coding:** Fuzzy & Neural control systems, comparison of fuzzy & Neural system, sensitivity Analysis. fuzzy image transform coding with adaptive fuzzy systems.	6

5	**Comparison of fuzzy & Kalman filter target tracking control systems:** Fuzzy & Math-model controllers, real time target tracking, fuzzy controller, Kalman filter controller.	**6**
6	**Neuronal Dynamics**: Neurons as functions, signal monotonicity, biological Activation & signals, neuron fields, common signal functions, pulse coded signal functions, additive neuronal dynamics, additive neuronal feedback, BAM connection matrices, additive dynamic & the noise saturation dilemma.	**9**
7	**Synaptic Dynamics:** Learning as encoding change & quantization, probability space & random process, stochastic equilibrium, signal Hebbian learning, competitive learning, supervised function estimation, supervised learning as operant conditioning, the Back propagation Algorithm.	**5**
8	**Architectures & Equilibria:** Neural Network as stochastic Gradient systems, global equilibria, global Stability of feedback neural network, structural stability of Unsupervised Learning, random Adaptive Bi-directional Associative Memories.	**5**

Learning Outcomes:-

After the successful completion of the course, students will be able to

- to understand basic concept of fuzzy logic and system.
- to do fuzzy image transform coding.
- to design neural networks.

Books Recommended:-

1. Neural Networks & fuzzy systems. **Bart Kosko,** PHI publication.
2. Artificial Neural Networks, **Robert J. Schalkoff,** MGH publication.
3. Artificial Intelligence and Intelligent Systems, **N. P. Padhy**, Oxford University Press.
4. Neural Networks, **Siman Haykin**, PHI publication.
5. Fuzzy Logic with Engineering Applications, **Timothy J. Ross**, Wiley India.
6. Neural Networks, **Kumar Satish**, TMH publication.