Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ETE703	Neural Networks and Fuzzy Logic	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% Weightage)		

Pre-requisite Course Codes	FEC 101 Applied Mathematics I	
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Basic Concepts and understanding of artificial neural networks
	CO2	Knowledge about the Design of different neural networks, their architecture and training algorithm
	CO3	Basic Concept of Fuzzy logic, Fuzzy Sets, fuzzy rules and fuzzy reasoning.
	CO4	Design the applicability of neural networks and fuzzy logic

Module No.	Unit No.	Topics	Ref.	Hrs.
1		**Introduction to Neural Networks and its Basic Concepts:**		08
	1.1	Biological neurons and McCulloch and Pitts models of neuron	1,2,4	
	1.2	Types of activation functions		
	1.3	Neural networks architectures		
	1.4	Linearly separable and linearly non-separable systems and their examples		
	1.5	Features and advantages of neural networks over statistical techniques		
	1.6	Knowledge representation, learning process, error-correction learning, concepts of supervised learning, and unsupervised learning		
2		**Supervised Learning Neural Networks:**	2,3	07
	2.1	Single layer perception and multilayer perceptron neural networks, their architecture		
	2.2	Error back propagation algorithm, generalized delta rule, learning factors, step learning		
	2.3	Momentum learning		
	2.4	Concept of training, testing and cross-validation data sets for design and validation of the networks		
3		**Unsupervised Learning Neural Networks:**	2,3,4	09
	3.1	Competitive earning networks, kohonen self-organizing networks		
	3.2	K-means and LMS algorithms		
	3.3	RBF neural network, its structure and Hybrid training algorithm for		

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		RBF neural networks		
	3.4	Comparison of RBF and MLP networks Learning		
	3.5	Vector Quantization neural network architecture and its training algorithm		
	3.6	Hebbian learning, Hopfield networks.	1,5	
4	**Applications of Neural Networks:**			06
	4.1	Pattern classification		
	4.2	Handwritten character recognition		
	4.3	Face recognition		
	4.4	Image compression and decompression		
5	**Fuzzy logic**		1,2,5	14
	5.1	Basic Fuzzy logic theory, sets and their properties		
	5.2	Operations on fuzzy sets		
	5.3	Fuzzy relation and operations on fuzzy relations and extension principle		
	5.4	Fuzzy membership functions and linguistic variables		
	5.5	Fuzzy rules and fuzzy reasoning		
	5.6	Fuzzification and defuzzification and their methods		
	5.7	Fuzzy inference systems, Mamdani Fuzzy models, and Fuzzy knowledge based controllers		
6	**Applications of Fuzzy Logic and Fuzzy Systems:**		3,4,6	08
	6.1	Fuzzy pattern recognition		
	6.2	Fuzzy image processing		
	6.3	Simple applications of Fuzzy knowledge based controllers like washing machines, traffic regulations, and lift control		
			Total	**52**

References:

1. S. Rajsekaran and G. A. Vijaylakshmi Pai, ―*Neural Networks, Fuzzy Logic, and Genetic Algorithms‖* , PHI

2. Simon Haykin, ―*Neural Network- A Comprehensive Foundation‖* , Pearson Education

3. Thimothy J. Ross, ―*Fuzzy Logic with Engineering Applications‖* , Wiley India Publications

4. Laurence Fausett, ―*Fundamentals of Neural Networks‖* , Pearson Education

5. S. N. Sivanandam, S. Sumathi, and S. N. Deepa, ―*Introduction to Neural Network Using MATLAB",* Tata McGraw-Hill Publications

6. Bart Kosko, ―*Neural networks and Fuzzy Systems",* Pearson Education