

GUJARAT TECHNOLOGICAL UNIVERSITY

SUBJECT: NEURAL NETWORKS AND FUZZY SYSTEMS

SUBJECT CODE: 2184103

B.E. 8th Semester

Type of course: Department Elective

Prerequisite: NA

Rationale: - This subject is useful to understand the aspects of artificial intelligence in terms of fuzzy logic and neural network for any mechatronics applications. Concepts of fuzzy logic and neural network explore the area of machine learning to fine tune and improve the accuracy with automatic control structures.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
				PA	ALA	ESE	OEP			
3	2	0	5	70	20	10	30	0	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	INTRODUCTION TO NEURAL NETWORKS: - Differences between Biological and Artificial Neural Networks Typical Architecture, Common Activation Functions, McCulloch - Pitts Neuron, Simple Neural Nets for Pattern Classification, Linear Separability - Hebb Net, Perceptron, Adeline, Madeline - Architecture, algorithm, and Simple Applications. Growth.	08	15%
2	PATTERN ASSOCIATION: - Training Algorithms for Pattern Association - Hebb rule and Delta rule, Hetero associative, Auto associative and Iterative Auto Associative Net, Bidirectional Associative Memory - Architecture, Algorithm, and Simple Applications.	09	25%

3	COMPETITION, ADAPTIVE RESONANCE AND BACK PROPAGATION NEURAL NETWORKS: - Kohonen Self Organising Maps, Learning Vector Quantization, Counter Propagation - Architecture, Algorithm and Applications - ART1 and ART2 - Basic Operation and Algorithm, Standard Backpropagation Architecture, derivation of Learning Rules, Boltzmann Machine Learning Architecture, Algorithm and Simple Applications.	09	24%
4	CLASSICAL AND FUZZY SETS AND RELATIONS:- Properties and Operations on Classical and Fuzzy Sets, Crisp and Fuzzy Relations - Cardinality, Properties and Operations, Composition, Tolerance and Equivalence Relations, Simple Problems.	08	20%
5	MEMBERSHIP FUNCTIONS: - Features of membership function, Standard forms and Boundaries, fuzzification, membership value assignments, Fuzzy to Crisp Conversions, Lambda Cuts for fuzzy sets and relations, Defuzzification methods. Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.	09	16%

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30%	30%	30%	10%	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom’s Taxonomy)

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. Sivanandam S N, Sumathi S, Deepa S N,” Introduction to Neural Networks using Mat lab 6.0Tata McGraw Hill Publications, New Delhi, 2006..
2. Timothy Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill, Singapore, 2002
3. John Yen and Rezalangari, "Fuzzy Logic, Intelligence, Control and Information ", Pearson Education, New Delhi, 2007.
4. Mohammad H Hassoun, "Fundamentals of Neural Networks", Prentice hall of India, New Delhi,2002.

Course Outcomes:

After successful completion of the course the students shall be able to:

1. Apply various soft computing frame works.
2. Design of various neural networks
3. Use fuzzy logic
4. Apply genetic programming.

List of Tutorials:

As per the topics of theory class.

Active Learning Assignments: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.