

SOFT COMPUTING TECHNIQUES

(Elective Subject)

Course Code:	13B1WEC831	Semester:	8th Semester, B. Tech (ECE), M.Tech(Ist year)
Credits:	3	Contact Hours:	L-3, T-0, P-0

Course Objectives

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. Introduce students to artificial neural networks and fuzzy theory from an engineering perspective

Course Outcomes

Upon completion of the course, the student are expected to

1. Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
2. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
3. To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations
4. Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications
5. Reveal different applications of these models to solve engineering and other problems.

Course Contents

Unit	Topics	References (chapter number, page no. etc)	Lectures
1.	Introduction to fuzzy set theory: Probabilistic reasoning, Fuzzy sets, mathematics of fuzzy set theory, operations on fuzzy sets, comparison of fuzzy and crisp set theory.	Ross Ch 1,2 Sivanandam Ch 7,8	4
2.	Fuzzy mapping: one to one mapping, max-min principle, extension principle, implication rules – mamdani implications. Membership functions: Universe of discourse, mapping inside fuzzy domain, fuzzy membership mapping methods, and application to real world problems.	Ross Ch 2,3 Sivanandam Ch 9,10	10
3	Artificial Neural Networks (ANN) and their biological roots and motivations. Comparison	Sivanandam Ch1,2	8

	Between Artificial and Biological Neural Networks, Applications of Neural network. Network Architecture ,Taxonomy of neural networks: feed forward and recurrent networks with. Merits and limitations of neurocomputing.	Haykin Ch1,2	
4	Types of learning, supervised and unsupervised learning laws . Learnig Laws : Hebb's rule, Delta rule, Widrow - Hoff (The Least-Mean-Square) learning rule, correlation learning rule, instar and outstar learning rules, Competitive learning, Credit Assignment Problem, Error Correction learning, Memory based learning, , Boltzmann learning.	Sivanandam Ch 3 Haykin Ch 3,4	10
5	The Perceptron and its learning law, Classification of linearly separable patterns, Multi-Layer Perceptron, Supervised Learning, Back-Propagation Learning law. Feed forward networks, Recurrent Networks.	Sivanandam Ch 3 Haykin Ch 4	6
6	Winner takes-all Networks, Competitive Learning, Kohonen's Self organizing Maps, Introduction to Adaptive Resonance Theory.	Sivanandam Ch 5	4
Total Number of Lectures			44

Evaluation Scheme

1. Test 1 :15 marks
2. Test 2 : 25 marks
3. Test 3 : 35 marks
4. **Internal Assessment** : 25 marks
 - 10 Marks : Class performance &Assignments
 - 10 Marks : Quizzes
 - 5 marks : Attendance

Text Books

- 1.Simon Haykin, "*Artificial Neural Networks*".
2. Yegna Narayanan, "*Artificial Neural Networks*".
3. Timothy J. Ross, "*Fuzzy Logic with Engineering Applications*".
4. S.N.Sivanandam, S.N Deepa, "*Principles of Soft Computing*"

Reference Books

1. Bart Kosko, "Neural Network and Fuzzy Systems: A Dynamic System Approach to Machine" Prentice-Hall 1998
2. L. Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms, and Applications", Prentice-Hall, 1994
3. Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co., Boston, 2002.

ONLINE MATERIAL

<http://nptel.ac.in/courses/117105084/>

<http://nptel.ac.in/courses/108104049/>