ADVANCE NEURAL NETWORKS

(Elective Subject)

Course Code:	13M1WEC231	**Semester:**	M. Tech. (ECE), 2nd year
Credits:	3	**Contact Hours:**	L-3, T-0, P-0

Course Objectives

1. To understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
2. Expose the students to neural network applications in engineering design.

Course Outcomes

Upon completion of the course, the student are expected to

1. Comprehend the fundamental theory and concepts of neural networks, and compare Biological neuron and artificial neuron networks.
2. Assess the power and usefulness of artificial neural networks and identify different neural network architectures, algorithms, applications and their limitations.
3. Select appropriate neural network architectures for a given application (i.e. they shall recognize the class of applications and relate it to specific architectures).
4. To understand Reveal different applications of these models to solve engineering and other problems as pattern matching, control, optimization, and other areas.
5. Study and analyze a research paper on application of Neural networks and must orally present their projects in the class.

Course Contents

Unit	**Topics**	**References (chapter number, page no. etc)**	**Lectures**
1.	INTRODUCTION TO NEURAL NETWORKS: Artificial Neural Networks (ANN) and their biological roots and motivations. Comparison Between Artificial and Biological Neural Networks, Applications of Neural network. Network Architecture, Taxonomy of neural networks: feed forward and recurrent networks.	Haykins Chapter 1 Sivanandam Chapter 1 and 2	6
2.	LEARNING PROCESS: Types of learning, Error Correction learning, Memory based learning, Boltzmann learning, Credit Assignment Problem. Learning paradigms: supervised and unsupervised learning laws. Learning Laws : Hebb's rule, Delta rule, Widrow - Hoff (The Least-Mean-Square) learning rule, correlation learning rule, instar	Haykins Chapter 2 Sivanandam Chapter 2 and 3	10

	and outstar learning rules, Competitive learning, Learning Tasks.		
3.	SUPERVISED LEANING: 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. RADIAL BASIS FUNCTION Neural Networks, Memory based learning, , Boltzmann learning.	Sivanandam Chapter 3,4 Haykin Chapter 3 ,4, 5	12
4.	UNSUPERVISED LEANING: Winner takes-all Networks, Competitive Learning, Kohonen's Self organizing Maps Self-organizing Feature-Mapping Algorithm; Properties of SOM algorithms; Examples of Feature Maps; Applications and Adaptive Resonance Theory.	Sivanandam Chapter 5 Haykin Chapter 9,14	8
5.	APPLICATIONS OF NN:ANNs as signal processing devices: Classification, Function approximation and pattern recognition problems. Solving Optimization Problems, Solving Traveling Salesman Problems. Application in Handwritten Character Recognition, Biomedical, Communication, and Healthcare.	Sivanandam Chapter 5,6	5
6.	One project- Research paper or design engineering problem		3
		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, Tutorials & Assignments
   - 10 Marks : Quizzes
   - 5 marks : Attendance

Text Books

1. Simon Haykin, "Artificial Neutral Networks".
2. Yegna Narayanan, "Artificial Neural Networks".
3. S.N.Sivanandam, S.Sumathi, "Introduction to Neural Networks using MATLAB".

4. S.N.Sivanandam, S.N Deepa, “Principles of Soft Computing”.

Reference Books

1. L. Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms, and Applications”, Prentice-Hall, 1994
2. 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/106105079/