III B.Tech – I Semester (20EC5634) ARTIFICIAL NEURAL NETWORKS (Honors)

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Int. Marks Ext. Marks Total Marks

30 70 100

Pre-Requisites: None

Course Objectives:

- To understand the biological neural network and to model equivalent neuron models •
- To study the dynamic models and Learning methods •
- To analyze the neural network for pattern recognition problems
- To introduce the Competitive Learning neural networks •
- To apply the concepts of ANN to different areas •

UNIT–I: Introduction

Characteristics of Neural Networks, Historical development, Terminology, Models of Neuron -McCulloch-Pitts Model, Perceptron, Adaline; Topology, Basic Learning Laws - Hebb's, Perceptron, Delta, Widrow and Hoff, Correlation, Instar, Outstar; Problems.

UNIT-II: Dynamic Models and Learning Methods

Activation Dynamic Models - Development, Additive Activation Models, Shunting Activation Models, Stochastic models; Synaptic Dynamic Models -Learning, Distinction between Activation and Synaptic Dynamics; Learning Methods - Hebbian, Competitive, Error correction, Reinforcement, Stochastic, Other learning methods; Stability and Convergence; Problems.

UNIT-III: ANN for Pattern Recognition Tasks

Pattern recognition problem, Basic Functional Units, Feedforward Neural Networks - Analysis of Pattern Associated Network, Analysis of Pattern Classification Networks, Analysis of Pattern Mapping Networks; Feedback Neural Networks - Analysis of Linear Auto-associative FF networks, Analysis of Pattern storage Networks, Stochastic Networks and Simulated Annealing.

UNIT-IV: Competitive Learning Neural Networks

Introduction, Components of Competitive Learning Network, Analysis of Feedback layer for different output functions, Analysis of Pattern Clustering Networks, Analysis of Feature Mapping Networks.

UNIT–V: Applications

Direct Application - Pattern classification, Associative Memories, Optimization, Vector Quantization, Control Applications; Application areas – Speech and Image Processing.

Course Outcomes:

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

| S.No | Course Outcome | BTL |
|------|---|-----|
| 1 | Understand the characteristics of Neural Networks and their learning laws | L2 |
| 2 | Perform the training of neural networks using various learning methods | L3 |
| 3 | Analyse the Pattern Recognition of Feedforward and Feedback neural networks | L4 |
| 4 | Analyze the competitive learning neural networks | L4 |
| 5 | Apply the concepts of ANN for the fields of Signal and Image Processing | L3 |

Correlation of COs with POs & PSOs:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|------------|------------|-----|-----|------------|-----|------------|------------|------------|-----|------|------|-------------|------|------|
| CO1 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | 3 | - |
| CO2 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 | - |
| CO3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 | - |
| CO4 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | 3 | - |
| CO5 | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 1 | 3 | - |

Text Books:

1. Artificial Neural Networks – B. Yegnanarayana, Prentice Hall of India, 2005.

2. Introduction to Artificial Neural Systems – Jacek M. Zurada, Jaico Publishing House, 2006.

Reference Books:

- 1. Neural Networks: A Comprehensive Foundations Simon Haykin, PHI.
- 2. Neural Networks in Computer Intelligence Li Min Fu, McGraw Hill, 2003.
- 3. Neural Networks James A Freeman, David M S Kapura, Pearson Education, 2004.