

Course Title: Neural Networks

Course no: CSC-311

Full Marks: 60+20+20

Credit hours: 3

Pass Marks: 24+8+8

Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)

Course Synopsis: This course contains concepts of Neural Networks.

Goal: To provide the knowledge of Neural Networks.

Course Contents:

1. Introduction (6 hrs)

Neural computing applications, Overview of neural computing, Engineering approaches to neural computing, ANNs: The mapping viewpoint, the structure view point, learning approaches, Relationship of ANN to other technologies, Historical efforts.

2. Mathematical Fundamentals for ANN (6 hrs)

Vector and matrix fundamentals, Geometry for state- space visualization, Optimization, Graphs and diagraphs.

3. ANN Building Blocks (5 hrs)

Overview and objectives, Biological neural units, Artificial unit structures, Unit net activation to output characteristics, Artificial unit model extension.

4. Single-Unit Mapping and the Perception (6 hrs)

Introduction, Linear separability, Techniques to directly obtain linear unit parameters, Perceptrons and Adaline/Madaline units and networks, Multilayer perceptrons (MLPs), Gradient descent training using sigmoidal activation functions.

5. Neural Mapping and pattern Associator Applications (5 hrs)

Neural network- based pattern associators, The influence of psychology on PA design and evaluation, Linear associative mapping, training, and examples, Hebbian or correlational-based learning.

6. Feedforward Networks and Training (7 hrs)

Multilayer- feedforward network structure, The delta rule and generalized delta rule, Architecture and training extensions, Ramification of hidden units, General multilayer FF network mapping capacity, Examples of FF design.

7. Feedforward Network: and Advanced topics (8 hrs)

Feedforward pattern associator design: Achieving desired mapping, Weight space, effort spaces, and search, Generalization, Non-Euclidean (output) error norms, Higher order derivatives-based training, The network architecture determination problem, Genetic algorithms for network training, Cascade correlation networks and algorithms, Network inversion.

8. Introduction to Fuzzy Neural Networks (2 hrs)

Warning, The strict Pragma, Other Perl Programs, Perl Internals, Perl's internal structures, Extending Perl, Embedding Perl, cooperating with other languages.