MCA 309: Artificial Neural Networks	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	**Examination Scheme** Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - Machine Learning

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
3. To give design methodologies for artificial neural networks
4. To provide knowledge for network tunning and overfitting avoidance
5. To offer neural network implementations.
6. To demonstrate neural network applications on real-world tasks

Detailed Syllabus

Unit-1

Overview of biological neurons: Structure of biological neurons relevant to ANNs. Fundament
oncepts of Artificial Neural Networks: Models of ANNs; Feed-forward & feedback networks; learni
ules; Hebbian learning rule, perception learning rule, delta learning rule, Widrow-Hoff learning ru
orrection learning rule, Winner –lake all learning rule, etc.

Head

Dean Academics

Unit-2

Single layer Perception Classifier: Classification model, Features & Decision regions; training & classification using discrete perceptron algorithm, single layer continuous perceptron networks for linearly separable classifications.

Unit-3

Multi-layer Feed forward Networks: linearly non-separable pattern classification, Delta learning rule for multi-perceptron layer, generalized delta learning rule, Error back-propagation training, learning factors, Examples. Single layer feedback Networks: Basic Concepts, Hopfield networks, Training & Examples.

Unit-4

Associative memories: Linear Association, Basic Concepts of recurrent Auto associative memory: retrieval algorithm, storage algorithm; Bi-directional associative memory, Architecture, Association encoding & decoding, Stability.

Unit-5

Fuzzy Logic and Genetic Algorithms: Fuzzy set theory, Crisp set, Crisp relations, Fuzzy relations, Fuzzy systems – crisp logic, Predicate logic, Fuzzy logic, Rule based system, Defuzzification methods. Genetic Algorithms- Basic concept, working principle, flow chart of genetic algorithms.

Unit-6

Applications of Neural Network: Approach to solve hard problems- Travelling Salesman problem, Time Series prediction, Speech Recognition, Autonomous Vehicle Navigation, Handwritten Digit Recognition, Image compression, Visual processing networks.

Text and Reference Books

1. "Introduction to artificial neural systems", Jacek M. Zurada, 1994, Jaico Publ. House.
2. "Neural Networks- A comprehensive foundation", Simon Haykin, Pearson Education Asia, II edition, 2002
3. "Neural Networks", Kosko, 1992, PHI.
4. "Neural Network fundamentals with Graph Algorithms & Applications", P. Liang and N.K. Bose, TMH, 2003.
5. "Neural Networks, Fuzzy Logic and Genetic Algorithms", S. Rajasekaran and G. A. V. Pai, PHI, 2003.

Course Outcomes:

After completing the course, students will be able 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.

Head
Department of Computer Applications
Faculty of Computer Applications
Invertis University, Bareilly (UP)

Registrar
Invertis University
Bareilly

Dean Academics
Faculty of Computer Applications
Invertis University, Bareilly (UP)