# 20AD41E3 - NEURAL NETWORKS AND FUZZY LOGIC

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| Course Category: | Professional Elective | Credits: | 3 |
| Course Type: | Theory | Lecture-Tutorial-Practical: | 3-0-0 |
| Prerequisite: | The Learners need to have the basic knowledge of Statistics, abstract Algebra and concepts of digital logic. | Sessional Evaluation:  Univ. Exam Evaluation:  Total Marks: | 40  60  100 |
| Objectives: | * To Facilitate adequate knowledge about supervised and unsupervised neural networks * To Introduce neural network design concepts * To Expose neural networks based methods to solve real world complex problems * To Teach about the concept of fuzziness involved in various systems * To Acquire knowledge of fuzzy logic to design the real world fuzzy systems | | |

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| Course Outcomes | Upon successful completion of the course, the students will be able to: | |
| CO1 | Apply the concepts of feed forward neural networks and their learning techniques. |
| CO2 | Comprehend the architecture, develop algorithms and apply the concepts of back propagation networks. |
| CO3 | Understand the techniques of storing association between patterns there by generating the best models |
| CO4 | Differentiate between the fuzzy and the crisp sets, apply the concepts of fuzziness and the fuzzy set theory. |
| CO5 | Select the membership functions, write rules and develop the fuzzy controller for Industrial applications. |
| CO6 | Demonstrate the working of fuzzy neural networks and identify its applications. |
| Course Content | UNIT-I  **Fundamentals of Neural Networks:** Basic concepts of Neural networks, Human Brain, Model of an Artificial Neuron, Neural network architectures, Characteristics of Neural Networks, Learning methods, Taxonomy of Neural Network Architectures, Early Neural Network Architectures.  UNIT-II  **Back propagation Networks:** Architecture of a Back propagation network, the Perceptron Model, The solution, Single layer Artificial Neural Network, Model for Multilayer Perceptron, Back propagation Learning, Illustration, Applications.  UNIT-III  **Associative Memory:** Auto correlators, Hetero correlators: Kosko's Discrete BAM, Wang et al.'s Multiple Training Encoding Strategy, Exponential BAM, Associative Memory for Real-coded Pattern Pairs, Applications, Recent Trends.  UNIT-IV  **Introduction to Fuzzy logic:** Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.  UNIT-V  **Fuzzy Membership and Rules:** Membership functions, Interference in Fuzzy logic, Fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications & Defuzzificataions, Fuzzy Controller, Industrial applications.  UNIT-VI  **Fuzzy Neural Networks:** L-R Type Fuzzy numbers, Fuzzy neutron, Fuzzy back propogation (BP), Architecture, Learning in fuzzy BP, Inference by fuzzy BP, Applications. | |
| Text Books &  Reference  Books | **TEXT BOOKS:**   1. S. Rajsekaran & G. A. Vijaya lakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications” Prentice Hall of India ,2003. 2. Satish Kumar, “Neural Networks-A class room approach”,2nd Edition, Tata McGrawHill,2013.   **REFERENCE BOOKS:**   1. Siman Haykin, “Neural Networks and Learning Machines”, Third edition, Prentice Hall of India Edition ,2009. 2. Timothy J. Ross, “Fuzzy Sets and Fuzzy Logic with Engineering Applications”, Fourth Edition, Wiley India,2021. | |
| E-Resources | 1. [www.academia.edu](http://www.academia.edu) 2. [www.sciencedirect.com](http://www.sciencedirect.com) | |