IV Year B. Tech. EEE II Semester

ARTIFICIAL INTELLEGENCE TECHNIQUES IN ELECTRICAL ENGINEERING (Professional Elective-V)

Prerequisite: Electrical Machines, Power Systems Analysis.

Course Objectives:

1. To understand soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms.

2. To understand the concepts of feed forward neural networks and about feedback neural networks.

3. To practice the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy controller

4. To analyze genetic algorithm, genetic operations and genetic mutations.

UNIT - I (~10 Lecture Hours)

ARTIFICIAL NEURAL NETWORKS

Introduction, Artificial Intelligence and Neural networks, Models of Neuron Network-Architectures - McCulloch-Pitts Model -Knowledge representation,-Learning process-Error correction learning, Hebbian learning - Competitive learning-Boltzman learning, supervised learning-Unsupervised learning-Reinforcement learning.

UNIT - II (~9 Lecture Hours)

ANN PARADIGMS

Perceptron, Multi-layer perceptron - Back propagation Algorithm (BPA), Self -Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network.

UNIT - III (~10 Lecture Hours)

FUZZY LOGIC

Introduction -Fuzzy versus crisp, Fuzzy sets-Membership function -Basic Fuzzy set operations, Properties of Fuzzy sets -Fuzzy Cartesian Product, Operations on Fuzzy relations – Fuzzy logic–Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system,
Defuzzification methods.

(15) Northern Hours)

UNIT -IV (~9 Lecture Hours)

GENETIC ALGORITHMS

Introduction-Encoding -Fitness Function-Reproduction operators, Genetic Modeling -Genetic operators-Cross over-Single site cross over, Two point cross over -Multi point cross over Uniform cross over, Matrix cross over-Cross over Rate-Inversion & Deletion, Mutation operator - Mutation - Mutation Rate-Bit-wise operators, Generational cycle-convergence of Genetic Algorithm.

UNIT-V (~8 Lecture Hours)

Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area system and two area system, Reactive power control, Speed control of DC and AC Motors.

1.S.Rajasekaran and G.A.V.Pai "Neural Networks, Fuzzy Logic & Genetic TEXT BOOKS:

2. Rober J. Schalkoff, "Artificial Neural Networks", Tata McGraw Hill Edition, 2011.

REFERENCE BOOKS:

- 1. P.D.Wasserman; "Neural Computing Theory & Practice", Van Nostrand Reinhold, New York, 1989.
- 2. Bart Kosko, "Neural Network & Fuzzy System", Prentice Hall, 1992
- 3. D.E.Goldberg, "Genetic Algorithms", Addison-Wesley 1999.
- 4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", 3rd Edition john Wiley & sons -2011.

Course Outcomes: After this course, the student will be able to

1. Understand soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms.

2. Develop feed forward neural networks, feedback neural networks and learning techniques.

Apply fuzzy logic principles in various systems and fuzzy set theory.

4. analyze genetic algorithm, genetic operations and genetic mutations.

Apply fuzzy logic control in electrical engineering

6. Apply genetic algorithm in electrical engineering.

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