PEE205 INTELLIEGENT ALGORITHMS IN POWER SYSTEMS

L	T	P	Cr
3	1	2	4.5

Course Objectives: To impart knowledge about basic significance of artificial intelligence in the area of decision making, recognition, similarity matching etc.To explain the concept of artificial neural network and its models, various learning algorithms in supervised and unsupervised mode, concept of fuzzy logic and fuzzy logic system, concept of genetic algorithms and genetic operator, to understand the hybrid structure .

Overview: Concepts of artificial intelligence (AI) and optimization, Introduction of various AI techniques, features and advantages in comparison to conventional methods, applications in electrical systems.

Artificial Neural Network: Review of ANN and learning processes, Learning algorithms, Transforming static neural network into dynamic, Neuronal filters, Supervised learning as an optimization method, Temporal back–propagation algorithm, neurodynamical model, Application of Hopfield neural network for constrained and unconstrained optimization, Stochastic machines, recurrent network architectures,

Fuzzy Logic: Review offuzzy sets and fuzzy systems, Development of membership function, Fuzzy measures, LR Fuzzy numbers, Fuzzy Bayesian decision making, Fuzzy system design and simulation, Fuzzy optimization, Solution of linear system under fuzzy environment, Multi–input, Multi–output system, Multi–objective decision making.

Evolutionary computation: Review of evolutionary computation techniques, algorithms and various operators, Mapping unconstrained and constrained optimization problems, Evolutionary programming

Multi-objective optimization: Comparison with single objective optimization, Concept of dominance, Non–dominated sorting, Multi-objective optimization using genetic algorithm.

Integrated Systems: Introduction to integrating systems like fuzzification of neural network, Neural–fuzzy controller, GA based fuzzy classification, GA based parameter learning of neural network.

AI Applications in Power Systems: Case studies such as Economic load dispatch, Load forecasting, Optimal power flow, transient stability and power system stabilizers, Hydro–thermal scheduling, voltage control, Protection system

Laboratory Work: Understanding the Fuzzy, Neural network and GA concepts through programming, MATLAB Tool boxes, Fuzzy system applications, Power system stabilizer, Neural network models and learning, Constrained optimization using neural network like Economic Dispatch, Implementing binary and real valued GA.

Minor Project: Implementation of Intelligent technique for economic load dispatch, speed control of induction motor, Load forecasting using Fuzzy logic

Course Learning Outcome: On the completion of the course, the student will be able

- To develop the neuron models with analog and discrete inputs, network architectures and training of network through various learning algorithms in supervised and unsupervised mode.
- To implement the concept of fuzzy logic concept and its implementation in controller applications
- To demonstrate the concept of evolutionary computation using Genetic algorithm for decision making problems.

Recommended Books

1. Ross, J. T., Fuzzy Logic with Engineering Applications, McGraw–Hill (1995).

2. S. Haykin, Neural Network : A Comprehensive Foundation, Pearson Education (2003).

3. Lin, C., Lee, G., Neural Fuzzy Systems, Prentice Hall International Inc. (2000)

4. Deb, K., Multiobjective Optimization using Evolutionary Algorithms, John Wiley and Sons (2002).

Evaluation Scheme:

S.No.	Evaluation Elements	Weightage (%)
1.	MST	25
2.	EST	35
3.	Sessionals (May include ssignments/Projects/Tutorials/Quizes etc.)	40