Course code: EE519

Course title: Computational Techniques in Electrical Engineering

Pre-requisite(s): Basics of signals and systems, Digital Signal Processing, Filter theory.

Syllabus

Module I

Introduction to Scientific Computing: Solution Of Non-Linear Equations, Numerical Solution Of Ordinary Differential Equation, Public-Domain Software Tools, Optimization Overview, Gradient-Based Methods, Linear Programming, Constrained Optimization Algorithm, Multi- Objective Optimization.

Module-II

Introduction to Computational Intelligent Techniques: Introduction, Definition and importance of Computational intelligent Techniques, Main Components of Computational intelligent Techniques: Fuzzy Logic Artificial Neural Networks, Swarm and Evolutionary Algorithms, Hybrid Intelligent Systems.

Module - III

Artificial Neural Network and Applications: Introduction, Artificial Neuron Structure, ANN Learning: Back-Propagation Learning, Unsupervised Learning, Radial Basic Function (RBF), Support Vector Machine (SVM), Recurrent Neural Network, Deep Neural Network.

Module IV

Fuzzy Logic, Evolutionary Algorithms and Applications: Introduction Of Fuzzy Logic, Fuzzy Cartesian Product, Fuzzy Relation, Defuzzification Methods, System's Modelling And Simulation Using Fuzzy Logic Approach, Selection of Defuzzification Method, Fuzzy Control System. Genetic Algorithm, Particle Swarm Optimization, Other Recent Heuristic Optimization Techniques. 8L

Module-V

Applications of Computational Techniques to Electrical Engineering: Applications of Artificial Neural Network, Genetic Algorithms, Fuzzy and Hybrid Systems In Power System Applications: Economic Load Dispatch, Unit Commitment, Condition Monitoring. Short Term Electrical Load Forecasting Applications of Soft Computing Techniques In Power Electronics And Control Applications. 8L

Textbooks:

l. Neural Networks: A Comprehensive Foundation - Simon Haykin, IEEE, Press, MacMillan, N.Y 1994.
2. S. Rajasekaran, G. A. Vijayalakshmi, Neural Networks, Fuzzy logic and Genetic algorithms, PHI publication.
3. Fuzzy logic with Engineering Applications – Timothy J. Ross, McGraw-Hill International Editions.
4. Fuzzy Sets and Fuzzy logic:- Theory and Applications - George J. Klir and Bo. Yuan, Prentice- Hall of India Private Limited.

Reference Books:

1. Chaturvedin Devendra K, Soft Computing Techniques and its Applications in Electrical Engineering, Hardcover ISBN:- 97-8-3-540-77480-8, Springer.
2. Kalyanmoy Deb, Optimization for Engineering Design, PHI publication
3. Kalyanmoy Deb, Multi-objective Optimization using Evolutionary Algorithms, Willey Publication
4. Kevin Warwick, Arthur Ekwue, Rag Aggarwal, Artificial intelligence techniques in power systems. IEE Power Engineering Series-22.