

**M.TECH FIRST SEMESTER  
SOFT COMPUTING TECHNIQUES IN POWER SYSTEMS**

**17EEPC1T4**

**Lecture: 4 periods/week**

**Credits: 4**

**Internal Assessment: 40 marks**

**End Semester Assessment: 60 marks**

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**Course Objective:**

This course covers soft computing technique paradigm along with the application of these tools in the power systems area.

**Course learning outcomes:** At the end of the course the student will be able to

1. Recognize the fundamentals & different types of Artificial Neural Networks (ANNs).
2. Differentiate between Algorithmic based methods and knowledge based methods(Fuzzy logic).
3. Infer the basic concepts, procedure and applications of Genetic Algorithm (GA).
4. Apply the basic concepts, procedure and applications of Particle Swarm Optimization (PSO) Technique in solving problems.

**UNIT-I: ARTIFICIAL NEURAL NETWORKS (ANN)**

Introduction, ANN Basic Building Blocks and Terminologies, ANN Basic Models, Learning Rules- Supervised Learning, Unsupervised Learning, Reinforced Learning, Hebbian Learning, Gradient Descent Learning, Perceptron Networks (Single layer / Multi layer), Feed Forward Networks- Back Propagation Networks (BPN), Feedback Networks - Hopfield Net, Applications of ANN.

**UNIT-II: FUZZY LOGIC**

Fuzzy Set Theory- Fuzzy versus Crisp, Crisp Sets, Fuzzy Sets – Membership Function, Basic Fuzzy Set Operations, Properties of Fuzzy Sets, Crisp Relations- Cartesian Product, Fuzzy Relations- Fuzzy Cartesian Product, Fuzzy Systems-Crisp Logic, Predicate Logic, Fuzzy Logic- Fuzzy Quantifiers, Fuzzy Inference, Fuzzy Ruled Based System, Defuzzification Methods, Applications.

**UNIT-III: GENTIC ALGORITHMS**

GA Basic concepts, Creation of Offspring's, Working Principle, Encoding, Fitness Function, Reproduction- Roulette-wheel Selection, Boltzmann Selection, Tournament Selection, Rank Selection, Elitism, Genetic Modeling – Inheritance Operators, Cross Over, Inversion and Deletion, Mutation Operator, Bit-wise Operators, Bit-wise Operators used in GA, Generational Cycle, Convergence of GA, Differences and Similarities between GA and other traditional methods, Advances in GA, Applications.

**UNIT-IV: PARTICLE SWARM OPTIMIZATION**

Basic concepts, Swarm intelligence, population, velocity updation, particle- best (pbest), global-best (gbest), velocity initialization, solution, Applications of PSO in power sytem optimization.

**TEXT BOOKS:**

1. S.Rajasekaran and G.A.V.Pai Neural Networks, Fuzzy Logic & Genetic Algorithms, PHI, New Delhi, 2003.
2. Clerc, M. "Particle Swarm Optimization". First Edition, Wiley-ISTE, 2006

**REFERENCE BOOKS:**

1. Jacek M. Zurada, "Introduction to Artificial Neural Systems", 1st Edition, Jaico Publishing House, 2007.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", John Wiley & Sons, 2009.
3. S. N. Sivanandam, S. Sumathi, S. N. Deepa, "Soft computing techniques ", Wiley publications.
4. F. Karray and C. De Silva, "Soft Computing and Intelligent Systems Design, Theory, Tools and Applications", Prentice Hall, 2004.