SOFT COMPUTING TECHNIQUES

Course Code: 13EE2113 **L P C**
4 0 3

Pre requisites: Basic Knowledge of Optimization.

Course Outcomes:

At the end of the course, the student will be able to

CO 1: Explain the fundamentals & different types of Artificial Neural Networks (ANNs) and their applications

CO 2: Defend Associate Memory Networks, SOM and ART

CO 3: Explain the fundamentals & procedure of Fuzzy Logic (FL) Technique and its applications

CO 4: Infer the basic concepts, procedure and applications of Genetic Algorithm (GA)

CO 5: Apply the basic concepts, procedure and applications of Particle Swarm Optimization (PSO) Technique in solving problems.

UNIT-I

ARTIFICIAL NEURAL NETWORKS (ANN) - I : (Fundamentals, Feed forward/Feedback Networks) Introduction, ANN Basic Building Blocks and Terminologies, ANN Models, Learning Rules, Perceptron Networks (Single layer / Multi layer), Feed Forward Networks- Back Propagation Networks (BPN), Feedback Networks - Hopfield Net, Applications.

UNIT-II

ARTIFICIAL NEURAL NETWORKS (ANN) - II: (Associative Memory Networks, SOM and ART)

Associative Memory Networks – Algorithms for pattern association, Hetero Associative Memory Neural Networks, Auto Associative Memory Networks, Bidirectional Associative Memory (BAM) Network, Relation between BAM and Hopfield Nets. Self-Organizing Feature Maps (SOM) – Kohonen SOM, Learning Vector Quantization (LVQ). Adaptive Resonance Theory (ART) – Fundamentals, ART1, ART2.

UNIT-III FUZZY LOGIC :

Fuzzy Set Theory- Fuzzy versus Crisp, Crisp Sets, Fuzzy Sets – Membership Function, Crisp Relations, Fuzzy Relations, Fuzzy Systems-Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, Applications.

UNIT-IV

GENETIC ALGORITHMS (GA) :

GA Fundamentals-Basic concepts, Creation of Offsprings, Working Principle, Encoding, Fitness Function, Reproduction, 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, Applications, Multi-level Optimization, Differences and Similarities between GA and other traditional methods, Advances in GA.

UNIT-V

PARTICLE SWARM OPTIMIZATION (PSO) :

Basic concepts, Swarm intelligence, population, velocity updation, particle- best (pbest), global-best (gbest), velocity initialization, solution, Applications.

Text Books:

1) S. N. Sivanandam, S. Sumathi, S. N. Deepa, "*Introduction to Neural Networks using MATLAB 6.0*", TMH, 2006 (Unit-I,II)
2) S. Rajasekharan and G.A. Vijayalakshmi Pai, "*Neural Networks, Fuzzy Logic, Genetic Algorithms - Synthesis and Applications*", First Edition, PHI Publication, 2012 (Unit III,IV)
3) Clerc, M. "*Particle Swarm Optimization*". First Edition, Wiley-ISTE, 2006 (Unit-V)

Reference Books:

1) J. S. R. Jang, C.T. Sun and E. Mizutani, "*Neuro-Fuzzy and Soft Computing*", Pearson Education, 2004.
2) N. Yadaiah and S. Bapi Raju, "*Neural and Fuzzy Systems*": Foundation, Architectures and Applications,Pearson Education, 2010.
3) Timothy J.Ross, "*Fuzzy Logic with Engineering Applications*", John Wiley & Sons, 2009.
4) Jacek M. Zurada, "*Introduction to Artificial Neural Systems*", 1st Edition, Jaico Publishing House, 2007.
5) F. Karray and C. De Silva, "*Soft Computing and Intelligent Systems Design, Theory, Tools and Applications*", Prentice Hall, 2004.