SCHEME OF COURSE WORK

Course Details:

Course Title	**: SOFT COMPUTING TECHNIQUES**		
Course Code	**: 13EE2113**	**L T P C**	**:4 0 0 4**
Program:	**: M.Tech.**		
Specialization:	**: Power System Control and Automation**		
Semester	**:II Sem**		
Prerequisites	**: Basic Knowledge of Optimization.**		
Courses to which it is a prerequisite	**: Project**		

Course Outcomes (COs):

1	Explain the fundamentals & different types of Artificial Neural Networks (ANNs) and their applications
2	Defend Associate Memory Networks, SOM and ART
3	Explain the fundamentals & procedure of Fuzzy Logic (FL) Technique and its applications
4	Infer the basic concepts, procedure and applications of Genetic Algorithm (GA)
5	Apply the basic concepts, procedure and applications of Particle Swarm Optimization (PSO) Technique in solving problems.

Program Outcomes (POs):

A graduate of M.Tech (Power System Automation and Control) will be able to

1	Acquire in depth knowledge in the area of power system control and automation.
2	attain the ability to think critically and analyze complex engineering problems related to power system control and automation
3	Obtain the capability of problem solving and original thinking to arrive at feasible and optimal solutions considering societal and environmental factors
4	Extract information through literature survey and apply appropriate research methodologies, techniques and tools to solve power system problems.
5	Use the state-of-the-art tools for modelling, simulation and analysis of problems related to power systems
6	Attain the capability to contribute positively to collaborative and multidisciplinary research to achieve common goals
7	Demonstrate knowledge and understanding of power system engineering and management principles and apply the same for efficiently carrying out projects with due consideration to economical and financial factors.
8	Communicate confidently, make effective presentations and write good reports with engineering community and society
9	Recognize the need for life-long learning and have the ability to do it independently
10	Become socially responsible and follow ethical practices to contribute to the community for sustainable development of society.
11	Independently observe and examine critically the outcomes of his actions and reflect on to make corrective measures subsequently and move forward positively by learning through mistakes

Course Outcome versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1		S	S			M					
CO-2		S	S			M					
CO-3		S	S			M					
CO-4		S	S			M					
CO-5		S	S			M					

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Introduction, ANN Basic Building Blocks and Terminologies, ANN Models, Learning Rules,	CO-1	SEE Modal paper	▫ Lecture ▫ Problem solving	Assignment (Week 2 - 4)
2	Perceptron Networks (Single layer / Multi layer), Feed Forward Networks-Back Propagation Networks (BPN),	CO-1	SEE Modal paper	▫ Lecture ▫ Problem solving	Mid-Test 1 (Week 9)
3	Feedback Networks - Hopfield Net, Applications.	CO-1	SEE Modal paper	▫ Lecture ▫ Problem solving	Quiz (Week 2 - 4)
4	Associative Memory Networks – Algorithms for pattern association, Hetero Associative Memory Neural Networks	CO-2	SEE Modal paper	▫ Lecture Problem solving	
5	Auto Associative Memory Networks, Bidirectional Associative Memory (BAM) Network, Relation between BAM and Hopfield Nets.	CO-2	SEE Modal paper	▫ Lecture Problem solving	
6	Self-Organizing Feature Maps (SOM) – Kohonen SOM, Learning Vector Quantization (LVQ). Adaptive Resonance Theory (ART) – Fundamentals, ART1, ART2.	CO-2	SEE Modal paper	▫ Lecture Problem solving	
7	Fuzzy Set Theory- Fuzzy versus Crisp, Crisp Sets.	CO-3	SEE Modal paper	▫ Lecture Problem solving	
8	Fuzzy Sets –Membership Function, Crisp Relations, Fuzzy Relations,	CO-3	SEE Modal paper		
9	**Mid-Test 1**		SEE Modal paper		
10	Fuzzy Systems-Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, Applications.	CO-3	SEE Modal paper	▫ Lecture ▫ Problem solving	Mid-Test 2 (Week 18)
11	GA Fundamentals-Basic concepts, Creation of Offsprings, Working Principle, Encoding, Fitness Function, Reproduction, Genetic Modeling	CO-4	SEE Modal paper	▫ Lecture Problem solving	Assignment (Week 11-13)
12		CO-4	SEE Modal paper	▫ Lecture Problem solving	Quiz (Week 12 -1 4)

13	Inheritance Operators, Cross Over, Inversion and Deletion, Mutation Operator, Bit-wise Operators, Bit-wise Operators used in GA,Generational Cycle, Convergence of GA,	CO-4	SEE Modal paper	▫ Lecture Problem solving	
14	Applications,Multi-level Optimization, Differences and Similarities between GA and other traditional methods, Advances in GA.	CO-5	SEE Modal paper	▫ Lecture Problem solving	
15	Basic concepts, Swarm intelligence, population, velocity updation,	CO-5	SEE Modal paper	▫ Lecture Problem solving	Assignment (Week 15)
16	particle- best (pbest), global-best (gbest), velocity initialization, solution,	CO-5	SEE Modal paper	▫ Lecture Problem solving	
17	Applications.			▫ Lecture Problem solving	
18	**Mid-Test 2**				
19/20	**END EXAM**				

Model Question Paper :

UNIT-I

1(a) Explain about Biological neuron with neat diagram? (6 M)

(b) Write short notes on Types of Neuron Activation Functions? (6 M)

2(a) Explain the Back propagation (BP) Training Algorithm? (8 M)

(b) Explain Hebbian learning Algorithm in detail? (4 M)

UNIT-II

3(a) What do you understand by associate memory networks? (6 M)

(b) What are Bidirectional Associative Memory (BAM) networks? Explain the training algorithm? (6 M)

4(a) Explain Competitive learning? (6 M)

(b) What are the ART networks? Explain? (6 M)

UNIT-III

5(a) Draw the block diagram representation of fuzzy logic system? Explain the function of each block? (6 M)

(b) What are various defuzzification methods? Explain. (6 M)

6(a) How the fuzzy different from crisp logic? Explain the properties of fuzzy sets? (6 M)

(b) How is membership function useful in fuzzy logic? Explain different membership functions used? (6 M)

UNIT-IV

7 Explain the following terms (1) Encoding (2) Fitness function (3) Selection (4) Crossover (5) Mutation (6) Chromosome (12 M)

8(a) Write short notes on (1) One point crossover (2) Two point crossover (8 M)

(b) Explain Roulette wheel selection? (4 M)

UNIT-V

9(a) What is PSO? How does it work? (6 M)

(b) What are some important applications of PSO? (6 M)

10(a) Write short notes on Velocity Updation? (6 M)

(b) What is particle best (p best) and global best (g best)? (6 M)