SWARM INTELLIGENCE TECHNIQUES IN POWER SYSTEMS

PEC-III: EPS

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BPSB14	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSEOVERVIEW:

This course gives a basic idea about the soft computing technique and also discusses about the discrimination of the capabilities of bio-inspired system and conventional methods in solving optimization problems and examines the importance of exploration and exploitation of swarm intelligent system to attain near global optimal solution. This course covers of various swarm intelligent systems like: Bee colony, ant colony etc. It will also help to employ various bio-inspired algorithms for power systems engineering applications.

II. COURSEOBJECTIVES:

The course should enable the students to:

I. Understand evolutionary algorithms like GA, PSO, ANT Colony and BEE colonyetc.
II. Apply these evolutionary algorithms to solve power systemsproblems.
III. Explain solution of multi objective optimization using thesealgorithms.

III. COURSE OUTCOMES:

After successful completion of the course, students will be able to:		
CO 1	**Illustrate** the capabilities of bio-inspired system and conventional methods in solving optimization problems	Understand
CO 2	**Analyze** the importance of exploration and exploitation of swarm intelligent system to attain near global optimal solution.	Apply
CO 3	**Distinguish** the functioning of various swarm intelligent systems for solving power system problems.	Apply
CO 4	**Develop** various bio-inspired algorithms for the power system engineering applications.	Apply
CO 5	**Categorize** the optimization problems using evolutionary techniques using genetic algorithms and particle swarm optimization.	Analyze
CO 6	**Analyze** the various search methods to for solving constrained and unconstrained optimization problems.	Analyze

IV.SYLLABUS:

UNIT-I	FUNDAMENTALS OF SOFT COMPUTING TECHNIQUES	Classes: 09

Definition classification of optimization problems unconstrained and constrained optimization optimality conditions Introduction to intelligent systems soft computing techniques conventional computing versus swarm computing classification of meta heuristic techniques single solution based and population based algorithms exploitation and exploration in population based algorithms, properties of Swarm intelligent Systems-application domain, discrete and continuous problems single objective and multi objective problems.

UNIT-II	GENETIC ALGORITHM AND PARTICLE SWARM OPTIMIZATION	Classes: 09

Genetic algorithms genetic algorithm versus conventional optimization techniques genetic representations and selection mechanisms, genetic operators different types of crossover and mutation operators bird flocking and fish schooling anatomy of a particle equations based on velocity and positions PSO topologies control parameters GA and PSO algorithms for solving ELD problems.

UNIT-III	ANT COLONY OPTIMIZATION AND ARTIFICIAL BEE COLONY ALGORITHMS	Classes: 09

Biological ant colony system: Artificial ants and assumptions, Stigmergic communications pheromone updating local global pheromone evaporation ant colony system ACO models touring ant colony system max min ant system concept of elasticants.

Task partitioning in honey bees: Balancing foragers and receivers-Artificial bee colony (ABC) algorithms, binary ABC algorithms ACO and ABC algorithms for solving economic dispatch of thermal UNITs.

UNIT-IV	SHUFFLED FROGLEAPING ALGORITHM AND BAT OPTIMIZATION ALGORITHM	Classes: 09

Bat algorithm: Echolocation of bats behaviour of micro bats acoustics of echolocation movement of virtual bats, Loudness and pulse Emission, Shuffled frog algorithm-virtual population of frogs-comparison of memes and genes memeplex formation, memeplex updation, BA and SFLA algorithms for solving ELD and optimal placement and sizing of the DG problem.

UNIT-V	MULTI OBJECTIVE OPTIMIZATION	Classes: 09

Multi Objective optimization introduction concept of pare to optimality-Non-dominant sorting technique pare to Fronts best compromise solution-min-max method-NSGA-II algorithm and applications to power systems.

Text Books:

1. Xin-She Yang, „Recent Advances in Swarm Intelligence and Evolutionary Computation" Springer International Publishing, Switzerland, 4th Edition,2015.
2. KalyanmoyDeb,„Multi-ObjectiveOptimizationusingEvolutionaryAlgorithms",JohnWiley&Sons, 2nd Edition,2001.

Reference Books:

1. James Kennedy and Russel E Eberheart, „Swarm Intelligence", The Morgan Kaufmann Series in Evolutionary Computation, 2nd Edition, 2001.
2. Eric Bonabeau, Marco Dorigo and Guy Theraulaz, „Swarm Intelligence-From natural to Artificial Systems", Oxford university Press, 2nd Edition, 1999.
3. David Goldberg, „Genetic Algorithms in Search, Optimization and Machine Learning", Pearson Education, 2nd Edition, 2007.
4. Konstantinos E. Parsopoulos and Michael N. Vrahatis, „Particle Swarm Optimization and Intelligence: Advancesand Applications", Information Science reference, IGI Global, 2nd Edition, 2010.
5. N P Padhy, „Artificial Intelligence and Intelligent Systems", Oxford University Press, 2nd Edition, 2005.

Web References:

1. https://www.researchgate.net/publication/277571471
2. https://www.researchgate.net/publication/220834557.

E-Text Books:

1. file.scirp.org/pdf/IJCCE_2013072414532965.pdf
2. rtpis.org/documents/mypaper/RTPIS_publication_1284584660.pdf·.