SWARM INTELLIGENCE TECHNIQUES IN POWER SYSTEMS

PE-III: EPS								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
BPSC15	**Elective**	3	0	0	3	30	70	100
Contact Classes: 45	**Total Tutorials: Nil**	**Total Practical Classes: Nil**				**Total Classes: 45**		

I. COURSE OVERVIEW:

This course gives a basic idea about the soft computing technique and also discuss about the discrimination of the capabilities of bio-inspired system and conventional methods in solving optimization problems and examine 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. COURSE OBJECTIVES:

The students will try to learn:

I. Evolutionary algorithms like GA, PSO, ANT Colony and BEE colony etc.
II. Evolutionary algorithms to solve power systems problems.
III. Solution of multi objective optimization using these algorithms.

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 optimisation problems	Understand
CO 2	**Analyse** 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:

MODULE –I: FUNDAMENTALS OF SOFT COMPUTING TECHNIQUES(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.

MODULE –II: GENETIC ALGORITHM AND PARTICLE SWARM OPTIMIZATIONSYSTEM(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.

MODULE –III: ANT COLONY OPTIMIZATION AND ARTIFICIAL BEE COLONY ALGORITHMS(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.

MODULE –IV: SHUFFLED FROGLEAPING ALGORITHM AND BAT OPTIMIZATION ALGORITHM(09)

Bat algorithm: Echolocation of bats behavior 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.

MODULE –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.

V. Text Books:

1. Xin-She Yang, 'Recent Advances in Swarm Intelligence and Evolutionary Computation' Springer International Publishing, Switzerland, 4th Edition, 2015.
2. Kalyanmoy Deb, 'Multi-Objective Optimization using Evolutionary Algorithms', John Wiley & Sons, 2nd Edition, 2001.

VI. Reference Books:

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

VII. Web References:

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

VIII. E-Text Books:

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