INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

SWARM INTELLEGENCE TECHNIQUES IN ELECTRICAL ENGINEERING								
VI Semester: EEE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
AEED31	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100
Contact Classes: 48	**Tutorial Classes: 0**	**Practical Classes: 0**				**Total Classes: 48**		
Prerequisite: Basic knowledge of electrical engineering principles, Familiarity with optimization techniques, Understanding of basic algorithms and programming concepts								

I. COURSE OVERVIEW:

This course explores the application of swarm intelligence techniques in solving complex problems in electrical engineering. Students will learn about various swarm algorithms, their principles, and applications in power systems, control systems, optimization, and other relevant areas. The course emphasizes both theoretical concepts and practical implementation through hands-on exercises and projects.

II. COURSES OBJECTIVES:

The students will try to learn:

I. Identify and recall the fundamental principles of Swarm Intelligence and its applications in electrical engineering.
II. Understanding: Explain the working mechanisms of SI techniques like ACO and PSO in solving electrical engineering problems.
III. Examine the performance of SI techniques in comparison to traditional optimization methods.
IV. Design and implement innovative SI-based algorithms tailored to specific challenges in electrical engineering.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO1 Understand the principles of swarm intelligence and its relevance to electrical engineering.

CO2 Apply various swarm algorithms to solve optimization problems in electrical systems.

CO3 Analyse the performance of different swarm algorithms in practical engineering applications

CO4 Implement swarm-based control strategies for power systems and other electrical systems.

CO5 Design and conduct experiments to evaluate the effectiveness of swarm intelligence techniques.

CO6 Explore advanced topics and emerging trends in swarm intelligence and their implications for Electrical Engineering.

IV.COURSE CONTENT:

MODULE – I: INTRODUCTION TO SWARM INTELLIGENCE AND SWARM ALGORITHMS (10)

Overview of swarm intelligence concepts, Historical development and motivation, Basic principles of collective behavior and self-organization, Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO), Artificial Bee Colony (ABC) algorithm, Differential Evolution (DE), Grey Wolf Optimizer (GWO), Firefly Algorithm (FA)

MODULE – II: APPLICATIONS OF SWARM INTELLIGENCE IN POWER SYSTEMS (10)

Optimal power flow and economic dispatch, Voltage and reactive power control, Load forecasting and demand-side management, Fault detection and diagnosis.

MODULE – III: SWARM-BASED CONTROL SYSTEMS (08)

Introduction to swarm-based control strategies, Swarm robotics and swarm-based automation, multi-agent systems and distributed control.

MODULE – IV: SWARM INTELLIGENCE IN OPTIMIZATION (10)

Engineering optimization problems, Met heuristic approaches and benchmark functions, Performance comparison of swarm algorithms.

MODULE – V: ADVANCED TOPICS (10)

Hybrid swarm intelligence algorithms, Dynamic optimization and adaptation, Swarm intelligence in renewable energy systems, Swarm intelligence for smart grid applications.

V.TEXT BOOKS:

1. "Swarm Intelligence: Principles, Advances, and Applications" by Kennedy, J. & Eberhart, R. (Publisher: Springer).

VI. REFERENCEBOOKS:

1. Swarm Intelligence in Engineering, Siddhartha Bhattacharyya and Paramartha Dutta, April 2015.
2. 2. Swarm Intelligence (The Morgan Kaufmann Series in Artificial Intelligence), James Kennedy, Russell C. Eberhart, Yuhui Shi- April 2001.

VII. WEB REFERENCES:

1.https://www.igi-global.com/book/swarm-intelligence-electric-electronic-engineering/69210.
2. https://link.springer.com/book/10.1007/978-3-642-17390-5

VIII. MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Assignments
5. Definitions and terminology
6. Open ended experiments
7. Model question paper-I
8. Model question paper-II
9. Lecture notes
10. Power point presentations
11. ELRV videos