Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NEED510	Power System Optimization	3	0	0	3

Course Objective

- The course will give basic concepts of load flow in electrical power systems, economic dispatch, optimal power flow and unit commitment problem of electricaltransmission system and their solution techniques with special emphasize on different optimization techniques to solve various power system optimization problems. However, strong fundamental knowledge about power system analysis is the prerequisite for the course.

Learning Outcomes

Upon successful completion of this course, students will learn

- Power system planning and operation
- Load flow study to estimate status of the power system under steady state conditions
- Techniques for Economic and optimal operation of a connected power network
- Soft computing skills for power system problems.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Introduction**: Components of power system; Power system and computers; Real time planning and operation of power system.	3	Understanding the impact of different components of power systems and its implication in planning and as well operation of power system.
2	**Load Flow Techniques:** Network model formulation; YBUS formulation; Load flow problem; Gauss-Seidel method; Newton-Raphson method; Fast decoupled load flow.	10	Load flow or power flow analysis is the determination of current, voltage, active power, and reactive volt-amperes at different points in a power system operating under steady state conditions. Load flow analysis are done to plan the best operation and control of the existing system as well as to plan the future expansion to keep pace with the growing load demand.
3	**Economic Dispatch:** Economic dispatch problem; Economic dispatch using Newton-Raphson method; Economic dispatch using exact loss formula; Economic dispatch based on penalty factors; Minimum emission dispatch.	9	By proper learning of the Economic load dispatch problem, user will be able to properly allocate generation among the available generating units to minimize the total generation cost satisfying different equality and inequality constraints.
4	**Optimal Power Flow:** Optimal reactive power dispatch; Optimal power flow based on Newton method; Decoupled method for optimal power flow; Security constrained optimal power flow.	5	By proper learning of the Optimal Power Flow, user will be able to properly allocate generation among the available generating units to minimize the total generation cost satisfying different equality and inequality constraints.
5	**Unit Commitment:**Unit commitment and maintenance scheduling; Optimal hydrothermal scheduling.	5	By proper learning of the Unit Commitment, user will be able to properly allocate generation among the available generating units under different equality and inequality constraints.
6	**Optimization Techniques:** Introduction to optimization techniques; multi-objective optimization – state-of-the-art; Evolutionary optimization; Genetic algorithm.	10	Principles of Different optimizations methods explained. Proper understanding will help the learner to yield optimum operating power system variables under steady state conditions.
	Total Contact Hours	**42**	

Text Books:

1. Power System Optimization: D.P. Kothari and J.S. Dhillon 2nd edition, PHI.
2. Soft Computing: With MATLAB Programming by N. P. Padhy and S. P. Simon, 1st Oxford University Press

Reference Books:

1. Introduction to Genetic Algorithms by S.N. Sivanandam, S. N. Deepa, 1st Edition, Springer, New York, 2010.