

Branch Name:	Electrical Engineering
ProgramCode:	ET213
CourseName:	Power System Optimization
CourseCode:	2ET2130204T
Pre-requisiteCourse:	Advanced Power System & Numerical Techniques

Course Objectives:

1. To study classical optimization techniques.
2. To understand nonlinear programming techniques.
3. To study the application of constrained optimization technique to economic load dispatch.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	Introduction: Fundamentals of Optimization, Feasibility and optimality, Convexity, constraints, Rates of convergence, Linear Programming: Standard form, geometry of LPP, Simplex Method for solving LPP, revised simplex method, duality, decomposition principle, and transportation problem.	08	20%
2	Unconstrained optimization: Introduction, Optimality conditions, Newton's method for minimization, Line search methods, Steepest-Descent method, Quasi-Newton method, Golden section method.	07	15%
3	Non-Linear Programming (NLP): Optimality conditions for constrained problems, Kuhn Tucker conditions, Penalty function method, Barrier method, The Lagrange multipliers and the Lagrangian function, Sensitivity analysis, Computing the Lagrange multipliers, Sequential quadratic programming, Interior point method- Economic dispatch solution using NLP.	12	25%
4	Genetic Algorithm for generation scheduling optimization: Introduction to genetic Algorithm, coding of variables, fitness function, GA operators; Economic Load Dispatch problem; Genetic algorithm solution Methodology, Multi-objective optimization.	08	20%
5	Modern methods of Optimization: Simulated Annealing, Particle Swarm Optimization, Ant Colony Optimization, Taguchi's Method of Optimization, Optimization of Fuzzy Systems, Multi-objective Optimization.	08	20%

Text Books:

1. "Engineering Optimization - Theory and Practices" - S.S.Rao, 3rd Ed., John Wiley & Sons, Inc.
2. "Introduction of Linear and Non-Linear Programming", David G. Luenberger, Wesley Publishing Company.

Reference Books:

1. "Optimization for Engineering Design: Algorithms and Examples", Kalyanmoy deb, PHI Publication.
2. "Power System Optimization", D.P. Kothari and J.S. Dhillon, 4th Ed., PHI Publication.
3. "Genetic Algorithm in Search Optimization and Machine Learning", D.E. Goldberg, Addison-Wesley Publication, 1989.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Acquire the knowledge regarding various classical optimization methods.	2 Understanding
CLO2	To apply and solve various real world optimization problems.	3 Applying 5 Evaluate
CLO3	Understand the fundamentals of unconstrained optimization.	2 Understanding
CLO4	Study and know about various nonlinear optimization methods.	1 Remembering
CLO5	To develop and find the solution of genetic algorithm.	4 Analyze 5 Evaluate
CLO6	apply different methods to solve optimization problems of electrical power systems.	4 Analyze 5 Evaluate

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1				M			L				M		M			L
CLO2	H	L			H	M		L			L			H	L	
CLO3				M			L				M		M			L
CLO4		L		H		M						M				L
CLO5		L				L			M			M				L
CLO6		L		H		L			M			M				L

H: High, M: Medium, L: Low