Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NCED517	Optimization Methods	3	0	0	3

Course Objective
The course aims at making students acquainted with the numerical techniques of linear and non-linear optimization methods. Another objective is introduction of evolutionary optimization techniques.
Learning Outcomes
Upon successful completion of this course, the students should be able to apply the optimization methods for the solution of engineering problems.

Unit No.	Topics to be Covered	Lectures	Learning Outcome
1	**Introduction to Optimization Problems:** Basics of engineering analysis and design, Need for optimal design, formulation of optimal design problems, basic difficulties associated with solution of optimal problems	4	To Formulate the optimum design problems
2	**Single variable unconstrained Optimization Problems:** Classical optimization methods, Necessary and sufficient optimality criteria for unconstrained and constrained problems, Kuhn-Tucker conditions, Global optimality and convex analysis.	10	Introduction to graphical and analytical optimization methods and optimality conditions
3	**Formulation and Solution of Linear Optimization Problems:** Linear optimal problems, Simplex method, Introduction to Karmarkar's algorithm.	7	Introduction to linear optimization and solution procedure.
4	**Numerical Methods of Nonlinear Optimization Problems:** Numerical methods for nonlinear unconstrained and constrained problems, sensitivity analysis.	12	Numerical methods of unconstrained and constrained optimization problems
5	**Introduction to Evolutionary Methods of Optimization:** Introduction to evolutionary methods: Genetic algorithm and simulated annealing.	6	Introduction to gradient free methods of optimization
6	**Computer programming for optimization methods** Implementation of the optimization algorithms for	3	Learn how to write computer programs for

	linear and nonlinear problems in computer program.		various optimization methods and solve problems.
Total contact hours		42	

Text Books:

1. Deb, K. (1998). Optimization for engineering design: Algorithms and examples, PHI Pvt Ltd.
2. Arora, J.S. (1989). Introduction to optimum design, McGraw Hill International editions.

Reference Books:

1. Hafta, R.T. and Gurdal, Z. (1996) Elements of structural optimization, third revised and expanded edition. Kluwer academic publishers.
2. Rao, S.S. (1996). Engineering optimization theory and practice.