

Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NCSD510	<b>OPTIMIZATION TECHNIQUES</b>	3	0	0	3

Course Objective
At the end of the course student will be able to <ul style="list-style-type: none"> <li>Understand the need of optimization methods</li> <li>Get a broad view of the various applications of optimization methods used in engineering</li> </ul>
Learning Outcomes
After successful completion of the course, student will be able to <ul style="list-style-type: none"> <li>Understand importance of optimization of industrial process management Apply basic concepts of mathematics to formulate an optimization problem.</li> <li>Analyse and appreciate variety of performance measures for various optimization problems</li> </ul>

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction: General statement of optimization problem, Classification of optimization Problems.	2	Understanding the basics of optimization techniques
2	Classical Optimization Techniques: singlevariable and multi-variable optimization.	4	Understanding the basics of single/multi-variable optimization techniques and network analysis
3	Network models: Network definition, minimal spanning tree algorithm, shortest route problem, shortest route algorithm, maximal flow model, enumeration of cuts, maximal flow algorithm, CPM, PERT.	4	Learning about various network model.
4	Linear programming (LP): Formulation and graphic solution Models of mathematical operations research, art of modeling, construction of the LP model, graphical LP solution. The Simplex method: Standard LP form, basic solution, The Simplex method, the Mmethod, the two-phase method, degeneracy, alternative optimal solution, unbounded solution, infeasible solution	4	Learning about linear programming.
5	Genetic algorithms: representation of design variables, objective function and constraints.	4	Understanding Genetic algorithm.
6	Transportation, assignment models: Definition of the transportation model, the transportation algorithm, definition of the assignment problem, the Hungarian method.	4	Understanding various transportation and assignment problems and its solutions.
7	Particle Swarm Optimization, Jaya algorithm, TLBO	4	Understanding the advanced optimization techniques
8	Chemical reaction optimization (CRO): Main algorithm, basic components, issues, Simulated Annealing	3	Understanding the CRO
9	Neural network based optimization	3	Understanding the Neural network based optimization techniques
10	Most recent optimization techniques such as Gravitational Search.	3	Understanding the Gravitational Search method.
11	Practical and computational aspects of optimization.	3	Understanding the Practical and computational aspects of optimization
12	Few applications based on nature inspired optimization techniques.	4	Understanding the applications based on nature inspired optimization techniques.
	Total	42	

#### Text Books:

1. Optimization in operations research by Ronald L. Rardin.
2. K. Deb, "Optimization for Engineering Design Algorithms and Examples", Prentice-Hall of India Pvt. Ltd.

#### Reference Books:

1. Operation Research by Kanti Swarup, P. K. Gupta, Man Mohan.
2. Optimization Methods: From Theory to Design Scientific and Technological Aspects in Mechanics by Cavazzuti Marco