Gautam Buddha University; Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
M. Tech. in Thermal Engg.	Optimization Techniques	MEE 501	SM+MT+ET 25+25+50
Semester	**Credits**	**L-T-P**	**Exam.**
I	4	3-1-0	3 Hours

Unit-I

Introduction to Optimization: Formulation of optimization problem; Classification of optimization problems; Optimum design of components like pins; beams; columns; shafts; spur gears; pressure vessels.   **(08 Hours)**

Unit-II

Linear Programming: Introduction; simplex method and duality in linear programming; sensitivity or post-optimality analysis; Karmarkar's method; problems.   **(06 Hours)**

Unit-III

One Dimensional Minimization: Optimality criterion; minimum bracketing methods like exhaustive search method; bounding phase method; optimum seeking methods like interval halving; golden section search; successive quadratic estimation; Newton Raphson; bisection; secant; cubic search method.
(08 Hours)

Unit -IV

Multivariable Unconstrained Optimization: Optimality criteria; direct search methods like evolutionary optimization method; Powell's conjugate direction method; gradient search methods like Cauchy's method; Newton's method; conjugate gradient method and variable metric method.   **(08 Hours)**

Unit -V

Constrained Optimization: Optimality conditions; optimization methods like penalty function method; method of multipliers; variable elimination method; complex search method; random search method; cutting plane method; feasible direction method; generalized reduced gradient method.   **(08 Hours)**

Unit -VI

Optimization Programming: Introduction of programming techniques; Geometric programming; integer programming methods like penalty function and branch and bound method.   **(07 Hours)**

Recommended Books:

1. Engineering Optimization Theory and Practice; S. S. Rao; New age international Ltd.; 1st Ed.; 1996.
2. Optimization for Engineering Design; Kalyanmoy Deb; Prentice Hall of India; New Delhi; 2nd Ed.; 2005
3. Introduction to Optimum Design; J. S. Arora; McGraw Hill; New York; 3rd Ed.; 1989.
4. Optimizing Performance of Energy Systems; S. S. Stricker; Battelle Press; New York; 1st Ed.; 1985.
5. Optimum Design of Mechanical Elements; R.C. Johnson; Willey; New York; 1st Ed.; 1980.