

Course Title	Course Code	Credit Hours
Engineering Optimization Techniques	AE-494	3-0

Textbook

- Jasbir S. Arora, “Introduction to Optimum Design”, Elsevier Science

Reference Books/Materials:

- G.N. Vanderplaats, “Numerical Optimization Techniques for Engineering Design with Applications”, [Vanderplaats Research & Development, Incorporated](#)
- D. G. Zill, W. S. Wright, “Advanced Engineering Mathematics”, Jones & Bartlett Learning

Course Objectives:

This course aims to familiarize students with the concept of optimization, its application to the design of mechanical components and systems, coding with MATLAB/MAPLE for the linear and nonlinear programming along with the approximation techniques to solve the optimization problems.

Course Outline:

- Introduction: Introduction to Optimization with Reference to Engineering Design, Operation Research and Management Problems, Optimization Problem Formulation, It will Include Engineering Design, Operation Research and Management.
- Standard Form of Optimization Problems: Identification of Objective Function, Design Variables and Constraints Introduction to Classification of Optimization Problems, Solution of Problems.
- Vector and Matrix Algebra: Introduction to Economic Analysis, Preliminary Mathematics Including Vector and Matrix Algebra. Familiarization to Mathematical/MATLAB, MAPLE.
- Solution of Linear and Nonlinear Problems: Graphical Solutions of Optimum Problems, Unconstrained/Constrained Optimum Problems with Analytical Techniques, Kuhn-Tucker Conditions. Linear Programming Applications for Design, Sensitivity Analysis with Applications to Engineering Design.
- Numerical Solutions: Nonlinear Design Optimum Problems and Their Solutions with

Numerical Techniques.

- Case Studies: Case Studies with Application of Optimum, Design Problems (Linear/Nonlinear), Transportation Problems (Linear Programming)