

Ort Braude College of Engineering

Department of Mechanical Engineering

Engineering Optimization – Course Outline

Credits: 3.0

Lecture hours: 3

Prerequisites: 23150 – Analytic Methods in Mechanical Engineering 1
23151 – Analytic Methods in Mechanical Engineering 2

Course objectives: Understanding the main concepts of optimization and the benefits in using optimization in engineering design.
Familiarization with different optimization methods and the way they can be used to solve various problems in the field of engineering.

Topics:

1. Classification of optimization problems
2. Conditions for local optimum
3. Linear programming and the Simplex method
4. Direct and indirect methods for unconstrained non-linear optimization problems
5. Lagrange method for solving constrained non-linear optimization problems
6. Karush Kuhn Tucker (KKT) conditions for constrained local optimum
7. Nature inspired heuristics: Genetic algorithms, Particle swarm optimization, Ant colony optimization
8. Multiobjective optimization
9. Evolutionary algorithms for solving multiobjective optimization problems
10. MATLAB tools for solving optimization problems

Suggested literature:

1. Singiresu S. Rao, Engineering optimization theory and practice 4th edition, John Wiley and sons Inc., 2009.
2. Revindran, A., Ragsdell, K.M., Reklaitis, G.V., Engineering Optimization, 2nd edition John Wiley and sons Inc., 2006.
3. Goldberg D., Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley Professional, 1989.
4. Kalyanmoy Deb, Multi-Objective optimization using Evolutionary Algorithms, John Wiley and sons Inc., 2001.