

OPTIMIZATION OF PROCESSES

Term	2 nd Semester, 1397-1398
Lecturer	Kiyanoosh Razzaghi E-mail: razzaghi@eng.usb.ac.ir. Tel.: +54 3113 2451 (int. 2451)
Time	Mon. & Wed. (09:30–11:00) Prof. Khoshnoodi's Conference Hall
Evaluation	Homework 20%, Midterm exam 35%, Final exam 45%
References	<ul style="list-style-type: none">▪ Engineering optimization: methods and applications, 2nd Edition (Ravindran, Ragsdell, Reklaitis), Wiley, 2006▪ Optimization of Chemical Processes, 2nd Edition (Edgar, Himmelblau, Lasdon), McGraw-Hill, 2001▪ Engineering Optimization: Theory and Practice, 4th Edition, (Rao), Wiley, 2009▪ Applied Optimization: Formulation and Algorithms for Engineering Systems (Baldick), Cambridge University Press, 2008▪ Optimization in Practice with MATLAB: For Engineering Students and Professionals (Messac), Cambridge University Press, 2015

LECTURES

- Lecture 1** Introduction to Optimization, Applications of Optimization in Engineering, Structure of Optimization Problems
- Lecture 2** Functions of a Single Variable, Properties of Single-Variable Functions, Optimality Criteria
- Lecture 3** Region Elimination Methods, Bounding Phase, Interval Refinement Phase, Polynomial Approximation Methods
- Lecture 4** Quadratic Estimation Methods, Successive Quadratic Estimation Method
- Lecture 5** Methods Requiring Derivatives: Newton–Raphson Method, Secant Method, Cubic Search Method
- Lecture 6** Functions of Several Variables, Optimality Criteria, Direct-Search Methods, Gradient-Based Methods: Cauchy's Method, Newton's Method, Conjugate Gradient Methods
- Lecture 7** Linear Programming, Formulation of Linear Programming Models, Graphical Solution of Linear Programs in Two Variables
- Lecture 8** Linear Program in Standard Form: Handling Inequalities, Handling Unrestricted Variables
- Lecture 9** Simplex Method, Use of Artificial Variables, Two-Phase Simplex Method
- Lecture 10** Constrained Optimality Criteria, Equality-Constrained Problems, Lagrange Multipliers, Kuhn–Tucker Conditions

- Lecture 11** Constrained Direct Search, Treatment of Equality Constraints, Generation of Feasible Starting Points
- Lecture 12** Random-Search Methods, Linearization Methods for Constrained Problems, Direct Use of Successive Linear Programs
- Lecture 13** Quadratic Approximation Methods for Constrained Problems, Direct Quadratic Approximation, Quadratic Approximation of the Lagrangian Function
- Lecture 14** Design Application, Problem Statement, General Formulation, Model Reduction and Solution
- Lecture 15** Strategies for Optimization Studies, Model Formulation, Levels of Modeling, Solution Evaluation
- Lecture 16** Engineering Case Studies, Optimization of an Ethylene Glycol–Ethylene Oxide Process, Optimal Design of a Compressed Air Energy Storage System