

14D002

6 ECTS

Deterministic Models and Optimization

Overview and Objectives

The main objective in this course is to give students a thorough grounding in optimization models, theory, and algorithms. The course level is introductory and the scope is broad, so only the most important and representative models and algorithms will be covered. Students will be expected to program as well as use software for optimization.

Prerequisite reading

Students should brush up on their undergraduate calculus and linear algebra before the class.

Course Outline

- a. Linear Programming (about 15 hours)
 - Formulations
 - The simplex method
 - Duality and Complementary Slackness
 - Zero-sum games
 - The transportation problem

- b. Combinatorial optimization algorithms (about 15 hours)
 - Graphs and networks
 - Greedy algorithms
 - Dynamic programming
 - Bipartite matching
 - Max-flow min-cost problems
 - Introduction to complexity theory

- c. Non-linear optimization (about 10 hours)
 - Convex sets and functions, convex optimization
 - Quadratic Programming
 - Iterative methods

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Required Activities

Exercises, lab, project.

Evaluation

Homework 15% / Project 25% / Final exam 60%

Materials

Recommended Books:

J. N. Franklin. *Methods of Mathematical Economics*. SIAM 2002.

J. Matousek and B. Gärtner. *Understanding linear programming*. Springer

2007. J. Kleinberg and E. Tardos. *Algorithm design*. Addison-Wesley 2005.

S. Boyd and L. Vandenberghe. *Convex Optimization*. Cambridge University Press 2004.