Recommended text books:


Course objectives:

Our main purpose is to cover a broad spectrum of topics in linear programming. We cover the basic material such as the simplex method and duality theory, and provide introduction to related techniques, such as dynamic programming and integer programming. A good part of the course will be devoted to the modeling power of linear programming and its applications particularly in business disciplines such as supply chains, finance, marketing etc. We will also introduce the modeling language AMPL for building LP models for simple applications, and use a related optimization package to solve small numerical examples.

Prerequisites:

Basic knowledge of linear algebra (solving systems of linear equations) and calculus. No computer programming knowledge is needed.

Tentative list of topics to be covered:


*Grading: 20% class participation, 40% home works, and 40% final exam. Class participation is checked regularly. Everyone has two chances not to submit homework on time (for whatever reasons). Homeworks are due by Sunday on the week they were posted. No late submissions are accepted.*

February 16, 2015: The two phase revised simplex algorithm. Applications: blending, diet planning, scheduling.


March 2, 2015: Weak and strong duality; complementary slackness. The Duality Theorem. Farkas’ lemma and a proof of strong duality.

March 9, 2015: Sensitivity analysis and interpretation of duality in terms of input-output models. Regression theory: $L_1$ and $L_\infty$ regression models; extracting trends, and modeling qualitative relations.

March 16, 2015: Spring Break!

March 23, 2015: Matrix games, Nash-equilibrium, connections to LP-duality, min-max theorems.

March 30, 2015: Assignment problems; primal-dual algorithms; the Hungarian method. Transportation problems and the primal-dual method.


April 13, 2015: Network flows, circulations; the law of conservation. Graphical min-max relations. Integrality property; the max-flow-min-cut theorem.

April 20, 2015: Dynamic programming; Dijkstra’s shortest path algorithm; Ford-Fulkerson algorithm for max-flows.


May 4, 2015: Dynamic programming for knapsack problems; approximation algorithms.

May 12, 2015: Final Exam!