

MATHEMATICAL PROGRAMMING

Course of the PhD Program in Mathematics

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Contents

The course offers an introduction to Linear Programming (LP) and Combinatorial Optimization (CO) also exploring some of the links between the two. The approach adopted is algorithmic.

Program

The two parts comprising the course (LP and CO) will not be treated strictly one after the other but rather in parallel where most convenient.

- Introduction to Linear Programming (LP)
 - 1 what is an LP problem
 - 2 modeling your problem as a linear program
 - 3 the simplex method (description and analysis)
 - 4 duality theory
 - 5 complementary slackness
 - 6 economic interpretation
 - 7 sensitivity analysis
 - 8 geometric interpretation
- Introduction to graphs and Combinatorial Optimization (CO)
 - 1 graphs and digraphs as models
 - 2 a few good characterizations (bipartite graphs, eulerian graphs, Planar Graphs, Chordal Graphs)
 - 3 shortest paths
 - 4 minimum spanning trees
 - 5 max flows and min cuts
 - 6 bipartite matching

Period

Trento (Povo), febbraio 2014.

Reference Material

- Linear Programming: Foundations and Extensions. Robert J. Vanderbei, Kluwer Academic Publishers (2001)
WWW: <http://www.princeton.edu/~rvdb/LPbook/>
- notes elaborated by the teacher
WWW: profs.sci.univr.it/~rrizzi/classes/MathProg
- notes and manuals borrowed from the web
WWW: profs.sci.univr.it/~rrizzi/classes/MathProg

WWW page of the course

`profs.sci.univr.it/~rrizzi/classes/MathProg`

Exam

Written+oral. At the end of the course, a written exam with several types of exercises and questions to assess the notions and competences acquired with the course. In the evaluation, only the correct answers, and when clearly stated and displayed, are taken into account. An answer without the explicitly required certificate has no value.

Prototype exercises are made available at the web page of the course:

`profs.sci.univr.it/~rrizzi/classes/MathProg`