Summary
This course is an introduction to linear and discrete optimization. We will discuss linear programming and combinatorial optimization problems like bipartite matchings, shortest paths and flows. Warning: This course is for mathematicians! Strong emphasis is put on formal mathematical proofs.

Content
• Linear Programming
• Simplex Algorithm
• Cycling and termination of the simplex algorithm
• Algorithms and Running times
• Diameter of Polyhedra
• Duality Theory
• Graphs and shortest paths
• Max. weight bipartite matchings
• Maximum flows

Keywords
Linear Programming
Algorithms
Complexity
Graphs

Learning Prerequisites
Required courses
• Linear Algebra
• Discrete Mathematics or Discrete Structures

Important concepts to start the course
The student needs to be able to prove theorems

Learning Outcomes
By the end of the course, the student must be able to:
• Choose appropriate method for solving basic discrete optimization problem
• Prove basic theorems in linear optimization
• Interpret computational results and relate to theory
• Implement basic algorithms in linear optimization
• Describe methods for solving linear optimization problems
• Create correctness and running time proofs of basic algorithms
• Solve basic linear and discrete optimization problems

Transversal skills
• Continue to work through difficulties or initial failure to find optimal solutions.
• Use both general and domain specific IT resources and tools

Teaching methods
Ex cathedra lecture, exercises in the classroom and with a computer

Expected student activities
Attendance of lectures and exercises
Completion of exercises
Solving supplementary programs with the help of a computer

Assessment methods
Written exam during the exam session

Resources
Bibliography
Dimitris Bertsimas and John N. Tsitsiklis: Introduction to Linear Optimization, Athena Scientific
Alexander Schrijver: Theory of Linear and integer Programming, Wiley

Ressources en bibliothèque
• Theory of Linear and Integer Programming / Schrijver
• Introduction to Linear Optimization / Bertsimas

Notes/Handbook
Lecture notes