

## Optimization

**Course level:** Master (M1) **Track(s):** MLDM

**ECTS Credits:** 3

**Education period (Dates):** 2<sup>nd</sup> semester

**Language of instruction:** English

**Expected prior-knowledge:** Data analysis, Advanced Algorithmics and Programming

Aim and learning outcomes:

This course presents an overview of optimization from its principles to the main algorithms.

Topics to be taught (subject to changes)~20h:

- Introduction to operational research and optimization (2h)
- Linear Programming and Simplex Method (6h)
- Convex sets and functions, Convex optimization problems, Constraints, Norms, Lagrange functions, Duality, optimality constraints, KKT conditions (3h)
- Gradient methods, Line-search methods, Newton's method (3h)
- Barrier functions, Interior point methods (3h)
- Non convex optimization methods, formulation of practical cases. (3h)

**Practical Laboratory Sessions~10h:** Practice of optimization softwares on study cases.

**Teaching methods:** Lectures and lab classes.

**Form(s) of Assessment:** written exam (2/3), practical work (1/3)

**Examination support:** None

**Literature and study materials:**

Basic textbooks:

- *Convex optimization*: Stephen Boyd, Lieven Vandenberghe
- *Practical optimization*: Philip E. Gill, Walter Murray, Margaret H. Wright

**Home page:** <http://mldm.univ-st-etienne.fr>