

# Optimization, Advanced Course

Programme course

6 credits

Optimeringslära fortsättningskurs

TAOP24

Valid from: 2017 Spring semester

**Determined by**

Board of Studies for Electrical Engineering,  
Physics and Mathematics

**Date determined**

2017-01-25

## Main field of study

Mathematics, Applied Mathematics

## Course level

First cycle

## Advancement level

G2X

## Course offered for

- Mathematics
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Computer Science, Master's programme
- Applied Physics and Electrical Engineering - International, M Sc in Engineering

## Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

## Prerequisites

Introduction to optimization.

## Intended learning outcomes

Optimization deals with mathematical theory and methods aiming at analyzing and solving decision problems that arise in technology, economy, medicine, etc. The course gives, together with the introductory course, a broad orientation of the field of optimization.

After the course, the student shall:

- be able to identify optimization problems and classify them according to their properties, into, for example, network problems or discrete problems
- construct mathematical models of more complex optimization problems

- have knowledge about and be able to apply basic solution principles for some classes of commonly appearing optimization problems, such as, for example, the simplex method for network flows
- be able to use commonly available software for solving optimization problems that appear regularly in applications
- be able to use relaxations to approximate optimization problems and heuristic methods for finding feasible solutions, and be able to estimate the optimal objective value through lower and upper bounds
- have good knowledge about practical applications of optimization methodologies

## Course content

A continuation of the material presented in the introductory course. The course includes more advanced topics within mathematical modelling, network optimization, sensitivity analysis in linear programming, discrete optimization, nonlinear optimization, and Lagrangian relaxation. Some new topics are also included, such as dynamic programming and heuristics.

## Teaching and working methods

Lectures which include theory, problem solving and applications. Exercises which are intended to give individual training in problem solving. A laboratory course with emphasis on modelling and the use of optimization software.

## Examination

TEN1	Written examination	U, 3, 4, 5	4 credits
LAB1	Laboratory course	U, G	2 credits

## Grades

Four-grade scale, LiU, U, 3, 4, 5

## Other information

Supplementary courses: Mathematical optimization.

## Department

Matematiska institutionen

## Director of Studies or equivalent

Ingegerd Skoglund

## Examiner

Oleg Burdakov

## Course website and other links

<http://courses.mai.liu.se/GU/TAOP24>

## Education components

Preliminary scheduled hours: 38 h

Recommended self-study hours: 122 h

## Course literature

Jan Lundgren, Mikael Rönnqvist & Peter Värbrand - Optimeringslära (Studentlitteratur, 2008). Jan Lundgren, Mathias Henningsson & Mikael Rönnqvist - Optimeringslära övningsbok (Studentlitteratur, 2008)

# Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at [http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning\\_pa\\_grund-\\_och\\_avancerad\\_niva](http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva).