Optimization

Programme course

6 credits

Optimeringslära

TNK049

Valid from: 2017 Spring semester

Determined by
Board of Studies for Industrial Engineering and Logistics

Date determined
2017-01-25

Main field of study
Mathematics, Applied Mathematics

Course level
First cycle

Advancement level
G2X

Course offered for
- Communications, Transport and Infrastructure, 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
Fundamentals in mathematical analysis and linear algebra

Intended learning outcomes
The course provides basic insights in optimization, especially optimization of linear and nonlinear (continuous) problems and problems with a network structure. After completing the course, the student should be able to:

analyze and formulate linear optimization models in the areas of economical and technical applications. analyze and formulate optimization models for problems with an underlying network structure. comprehend the basic mathematical theory on which the models and algorithms are based. apply and utilize optimization methods for optimization problems in continuous variable, such as the simplex method, the simplex method adapted for network problems, descent methods for unconstrained problems and the Frank–Wolfe algorithm. analyze optimization models with respect to convexity and formulate optimality conditions for problems in continuous variables. solve optimization problem both manually and by using computer software.

Course content

- Linear programming: Modeling, basic mathematical theory and geometry, the simplex method, sensitivity analysis, duality, optimality conditions.
- Nonlinear optimization: Modeling, convexity, unconstrained optimization, linearly constrained optimization, optimality conditions.
- Network optimization: Modeling, tree problems, path problems, versions of the minimum cost flow problem and the simplex method applied to problems with network structure.

Teaching and working methods

Lectures, exercises and laborations.

Examination

LAB1	Laboratory work	1.5 credits	U, G
TEN1	Written examination	4.5 credits	U, 3, 4, 5

Grades

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

Other information

Supplementary courses:
Advanced courses in optimization.

Department

Institutionen för teknik och naturvetenskap

Director of Studies or equivalent

Erik Bergfeldt

Examiner

Anders Peterson

Education components

Preliminary scheduled hours: 48 h
Recommended self-study hours: 112 h

Course literature

Additional literature

Books

Henningsson, M., Lundgren, J., Rönnqvist, M. och P. Värbrand,
Optimeringslära: Övningsbok senaste
Lundgren, Jan, Rönnqvist, Mikael, Värbrand, Peter, (2008) *Optimeringslära*
ISBN: 9789144053141
Lund : 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.