Optimization, Modeling and Planning

Programme course

6 credits

Optimering, modellering och planering

TNSL05

Valid from: 2017 Spring semester

Determined by
Board of Studies for Industrial Engineering and Logistics

Date determined
2017-01-25

Main field of study
Applied Mathematics, Logistics

Course level
First cycle

Advancement level
G2X

Course offered for
- Air Transportation and Logistics, Bachelor's Programme
- Civic Logistics, Bachelor´s Programme

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
Basic courses in Math Analyses, Algebra and Logistics.

Intended learning outcomes
This course gives an introduction to operations reseach, in particular modelling and solving linear programming problems, optimization problems with network structures and integer programming proglems. The application focus is on models related to logistics and supply chain management. After completed course the students shall

- have the knowledge on how to formulate and analyze optimization models in economic applications.
- understand the basic mathematical theories that are the foundation for models and algorithms.
- Analyze and understand sensitivity analyses for linear programming problems and network problems
- be able to use and draw conclusions from optmization methods for linear programming, especially the Simplex method, for integer prrogramming, especially tree-search methods, and network/graph based methods.

Course content

The course covers the following areas:

- Introduction to mathematical modelling
- Introduction to algortihms for optimization
- Classification of problems
- Optimality conditions
- Modelling of linear programming problems
- Methods for linear programming problems (basic solution concept)
- Sensitivity analyses
- Network modelling
- Basic problem types and methods for network problems (shortest path and minimum cost flow problems)
- Integer programming problems modelling

Teaching and working methods

The lectures introduce concepts and methods. Lessons are used for exercises and computer laborations are used for solving larger optimization models.

Examination

UPG1	Group assignments	2 credits	U, G
LAB1	Laboratory work	2 credits	U, G
TEN1	Written examination	2 credits	U, 3, 4, 5

Grades

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

Department

Institutionen för teknik och naturvetenskap

Director of Studies or equivalent

Erik Bergfeldt

Examiner

Joakim Ekström

Education components

Preliminary scheduled hours: 50 h
Recommended self-study hours: 110 h

Course literature

Additional literature

Books

Henningsson, Lundgren, Rönnqvist, Värbrand,, *Optimeringslära: övningsbok* 2:a uppl
ISBN: 91-44-06760-7
Lundgren, Jan, Author, Rönnqvist, Mikael, Author, Värbrand, Peter, Author, Linköpings universitet, Institutionen för teknik och naturvetenskap, Originator, Linköpings universitet, Tekniska högskolan, Originator, Linköpings universitet, Matematiska institutionen, Optimeringslära, Originator, (2003) *Optimeringslära* Lund: Studentlitteratur, 2003.

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.