



LUND
UNIVERSITY

Faculty of Science

MATC51, Mathematics: Optimization, 7.5 credits

Matematik: Optimering, 7,5 högskolepoäng

First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2016-02-24 and was last revised on 2016-02-24. The revised syllabus applies from 2016-02-24, spring semester 2016.

General Information

The course is an elective course at first cycle level for a Bachelor or Master of Science degree in mathematics.

Language of instruction: English

Main field of studies

Mathematics

Depth of study relative to the degree requirements

G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The aim of the course is that students should have acquired the following knowledge and skills:

Knowledge and understanding

On completion of the course, the student should be able to:

- give an account of the relations between the concepts treated in the course with adequate terminology, in well-structured and logical coherent way.

Competence and skills

On completion of the course, the student should be able to:

- present and discuss mathematical arguments in speech and in writing,
- solve mathematical optimization problems with and without constraints,
- handle optimization problems by writing computer programs that implement relevant algorithms,
- solve simple problems of theoretical nature within optimization,
- give an account of optimization theory and solutions to mathematical optimization problems with adequate terminology, appropriate notations, in well-structured and logical coherent way.

Course content

- Repetition of quadratic forms and matrix factorisation.
- Convexity.
- Theory of optimization with and without constraints: Lagrange functions, Kuhn-Tucker theory. Duality.
- Methods for optimization without constraints: line search, steepest descent, Newton methods, conjugate directions, non-linear least squares optimization.
- Methods for optimization with constraints: linear optimization, quadratic programming, penalty and barrier methods. Simplex method.

Course design

The teaching consists of lectures, seminars, exercises, computer exercises and a smaller programming project that should be completed during the course. Participation in computer exercises and programming projects and thereby integrated teaching is compulsory.

Assessment

The examination consists of a written examination, an appurtenant oral examination and project work assessment. Oral examination is given only for those students who passed the written examination.

Students who fail the ordinary written examination are offered a resit examination shortly thereafter.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.

To pass the entire course, passed computer exercises are required, passed written and oral examination and passed project report. The final grade is decided by the grade in written and oral examination.

Entry requirements

For admission to the course, at least 60 credits in mathematics and numerical analysis are required, including the courses MATB22 Linear algebra 2, 7.5 credits, MATB21 Multivariable analysis 1, 7.5 credits, NUMA01 Computational Programming with Python, 7.5 credits, or equivalent.

Further information

The course is coordinated with the course FMA051 Optimization, 6 credits, given by LTH, and can not be part of a degree together with this course.

Subcourses in MATC51, Mathematics: Optimization

Applies from V16

- 1601 Written Exam, 6,0 hp
Grading scale: Fail, Pass, Pass with distinction
- 1602 Project, 0,0 hp
Grading scale: Fail, Pass
- 1603 Oral exam, 1,5 hp
Grading scale: Fail, Pass