COURSE SYLLABUS
Linear Algebra and Optimization, 7.5 credits

Linjär algebra och optimering, 7,5 högskolepoäng

Course Code:	TAOG19	**Education Cycle:**	First-cycle level
Confirmed by:	Dean Jun 1, 2019	**Disciplinary domain:**	Natural sciences
Revised by:	Nov 5, 2021		
Valid From:	Jan 1, 2022	**Subject group:**	MA1
Version:	2	**Specialised in:**	G1N

Intended Learning Outcomes (ILO)

After a successful course, the student shall

Knowledge and understanding
- display knowledge of vectors, matrices and the basic operations, defined for these objects
- display knowledge of systems of linear equations, their possible solution sets, as well as how can these be formulated as matrix equations
- display knowledge of what constitutes a linear programming problem

Skills and abilities
- demonstrate the ability to use Gauss elimination and basic matrix algebra to solve systems of linear equations
- demonstrate the ability to use vector operations and linear systems to solve geometrical problems in two or three dimensions
- demonstrate the ability to calculate determinants, eigenvalues of square matrices, draw conclusions about unique solvability of square linear systems, matrix singularity and linear dependence of vectors
- demonstrate the ability to formulate a real world problem as a linear programming problem
- demonstrate the ability to use graphs and the Simplex algorithm to solve limited-sized linear programming problems and to draw sensitivity conclusions from the solutions
- demonstrate the ability to formulate the dual of a linear programming problem and to draw conclusions from its solution
- demonstrate the ability to use computer software to solve linear algebraic and optimization problems

Contents

The course introduces several elements from the linear algebra as well as techniques for linear optimization.

The course includes the following elements:
- Systems of simultaneous linear equations and Gauss elimination

- Vectors, basic operations and some vector geometry
- Matrices and matrix algebra
- Eigenvectors and eigenvalues
- Linear programming
- Graphical solutions to two-dimensional linear programming problems
- The Simplex method and sensitivity analysis
- Duality in linear programming
- Examples of computer software for optimization.

Type of instruction

Lectures, seminars and computer exercises.

The teaching is conducted in English.

Prerequisites

General entry requirements and Physics 1, Chemistry 1, Matematics 3c or Physics A, Chemistry A, Matematics D and English 6 or English B in the Swedish upper secondary school system or international equivalent (or the equivalent).

Examination and grades

The course is graded 5,4,3 or Fail.

Registration of examination:

Name of the Test	Value	Grading
Written examination	7.5 credits	5/4/3/U

Course literature

The literature list for the course will be provided 8 weeks before the course starts.

Hardy: Linear algebra for engineers and scientists using Matlab, Pearson,
 ISBN 0-13-010988-6