

## COURSE SYLLABUS

**Linear Algebra and Optimization, 7.5 credits***Linjär algebra och optimering, 7.5 högskolepoäng*


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Course Code: TAOG19	Education Cycle: First-cycle level
Confirmed: Feb 06, 2025	Disciplinary domain: Natural sciences
Valid From: Jan 19, 2026	Subject group: Mathematics
	Specialised in: First cycle, has only upper-secondary level entry requirements

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**Intended Learning Outcomes (ILO)**

On completion of the 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

**Content**

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.

Language of instruction is in English.

## Entry requirements

General entry requirements and Physics 1, Chemistry 1, Mathematics 3c or Physics A, Chemistry A, Mathematics 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 U.

Registration of examination:

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

## Course literature

Please note that changes may be made to the reading list up until eight weeks before the start of the course.

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