# Matrix Analysis

Matrisanalys
6 credits

Programme course

TATB10

Valid from: 2026 Spring semester

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|---|---|---|
| **Determined by** | **Main field of study** | |
| | Mathematics, Applied Mathematics | |
| **Date determined** | **Course level** | **Progressive specialisation** |
| 2025-08-28 | Second cycle | A1F |
| **Revised by** | **Disciplinary domain** | |
| **Revision date** | **Subject group** | |
| **Offered first time** | **Offered for the last time** | |
| VT2026 | | |
| **Department** | **Replaced by** | |
| Matematiska institutionen | | |

## Course offered for

- Master of Science in Engineering Mathematics
- Master of Science in Applied Physics and Electrical Engineering - International
- Master of Science in Applied Physics and Electrical Engineering
- Master's Programme in Mathematics

## Prerequisites

Linear Algebra, Honours Course or similar

## Intended learning outcomes

After completing the course the student should be able to communicate, apply, model, analyze and solve problems by using the concepts and methods described in the course content.

## Course content

Properties of matrix rank. Block matrices and Schur complement. Special matrices: Toeplitz, circulant, Vandermonde, Hankel, and Hessenberg matrices. Companion matrices. Real and complex canonical forms. Vector and matrix norms.

Eigenvalues: location, inequalities, perturbations, variational characterization.

Singular values: inequalities, variational characterization, low rank approximation for unitarily invariant norms.

Functions of matrices, power series. Matrix products: Kronecker, Hadamard and Khatri-Rao products. Linear and nonlinear matrix equations. Matrices of functions, matrix calculus and differentiation.

Multilinear algebra: rank, decomposition and approximation of tensors.

## Teaching and working methods

Lectures and seminars with student presentations

## Examination

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|---|---|---|---|
| UPG1 | Assignments and projects | 6 credits | U, 3, 4, 5 |

UPG1 also includes oral and written presentations

# Grades

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