*Course syllabus*

# Matrix Theory
# Matristeori

## FMAN70, 6.0 credits, A (Second Cycle)

**Valid for:** 2025/26
**Faculty:** Faculty of Engineering LTH
**Decided by:** PLED F/Pi
**Date of Decision:** 2025-04-10
**Effective:** 2025-05-05

## General Information

**Main field:** Technology **Depth of study relative to the degree requirements:** Second cycle, in-depth level of the course cannot be classified
**Mandatory for:** Pi3
**Language of instruction:** The course will be given in English on demand

## Aim

The main aim of the course is to convey knowledge about concepts and methods from matrix theory and linear algebra which are important in applications within many subjects in technology, science and economy, and familiarity with their use. In addition, the course should develop the student's ability in general to assimilate and communicate mathematical theory and to solve problems. Furthermore, the course should strengthen the student's ability in mathematical programming.

## Learning outcomes

*Knowledge and understanding*
For a passing grade the student must

- independently be able to characterize and use different types of matrix factorizations.
- be able to understand and independently explain the theory of matrix functions, in particular polynomials, and its connection to the Jordan normal form.

- be able to describe different types of vector and matrix norms, and to compute or estimate them as well with as without computer support.
- be familiar with the common classes of normal matrices and their properties.

*Competences and skills*
For a passing grade the student must

- with access to literature be able to integrate methods and approaches from the different parts of the course in order to solve problems and answer questions within the framework of the course.
- with access to literature be able to write Matlab programs for the solution of mathematical problems within the framework of the course.
- orally and in writing, with clear logic and with proper terminology be able to explain the solution to a mathematical problem within the framework of the course.
- with access to the resources of a library be able to independently assimilate and sum up the contents of a text in technology in which matrix theoretical methods are used.

## Contents

Matrices and determinants. Linear spaces. Spectral theory.The Jordan normal form. Matrix factorizations. Matrix polynomials and matrix functions. Norms. Scalar products. Singular values. Normal matrices. Quadratic and Hermitian forms. The Least Squares method and pseudo inverses.

## Examination details

**Grading scale:** TH - (U, 3, 4, 5) - (Fail, Three, Four, Five)
**Assessment:**

Take-home exam followed by an oral exam. Two minor projects should be completed before the exam.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

**Modules**
**Code:** 0117. **Name:** Matrix Theory.
**Credits:** 6.0. **Grading scale:** TH - (U, 3, 4, 5).

## Admission

**Admission requirements:**

- FMA420 Linear Algebra **or** FMA421 Linear Algebra with Scientific Computation **or** FMAA20 Linear Algebra with Introduction to Computer Tools **or** FMAA21 Linear Algebra with Numerical Applications **or** FMAB20 Linear Algebra **or** FMAB22 Linear Algebra

**Assumed prior knowledge:** FMAF05 Systems and Transforms or FMAF10 Applied Mathematics - Linear systems.
**The number of participants is limited to:** No

**Kursen överlappar följande kurser:** FMA120 FMA121 MATC70 FMAN71

## Reading list

- Holst, A & Ufnarovski, V: Matrix Theory. Studentlitteratur, 2014, ISBN: 978-91-44-10096-8.

## Contact

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