



# SF2832 Mathematical Systems Theory 7.5 credits

## Matematisk systemteori

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

## Establishment

The course syllabus is valid from Autumn 2022 according to the school principal's decision: S-2022-0925 Decision date: 2023-09-06

## Grading scale

A, B, C, D, E, FX, F

## Education cycle

Second cycle

## Main field of study

Mathematics

## Specific prerequisites

- English B / English 6
- Completed basic course in mathematical statistics (SF1914, SF1918, SF1922 or equivalent)
- Completed basic course in numerical analysis (SF1544, SF1545 or equivalent)
- Completed basic course in differential equations (SF1633, SF1683 or equivalent).

## Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

## Intended learning outcomes

To pass the course, the student shall be able to

- Analyze linear systems with respect to stability, minimality, observability, and reachability.
- Use design methods for state feedback and optimal filtering, and analyze properties of the closed loop system.
- Apply the methods given in the course to solve example problems and use Matlab to solve realistic problems numerically.

To receive the highest grade, the student should in addition be able to

- Combine and explain the tools in the course and apply them to more complex problems.

## Course contents

- Linear systems
- Systems of linear differential equations
- Controllability and observability
- Stability
- Minimality and realization
- Feedback, pole placement and observer
- Linear quadratic control, Riccati equations
- Kalman filters.

## Examination

- HEM2 - Homework, 1.5 credits, grading scale: P, F
- TEN2 - Written exam, 6.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

## Ethical approach

- All members of a group are responsible for the group's work.

- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.