



# SF2852 Optimal Control Theory

## 7.5 credits

Optimal styrteori

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

### Establishment

The course syllabus is valid from Spring 2022 according to the school principal's decision:  
S-2022-0529 Decision date: 2022-02-24

### 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 optimization (SF1811, SF1861 or equivalent)
- 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 do the following:

- Formulate optimal control problems on standard form from specifications on dynamics, constraints and control objective. In addition, be able to explain how various control objectives affect the optimal performance.
- Use the methods in the course to design closed loop and open loop controllers for optimal control problems.
- Apply the methods given in the course to solve example problems and use computational software to solve realistic problems numerically.

To receive the highest grade, the student shall in addition be able to do the following:

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

## Course contents

- Dynamic programming in continuous and discrete time.
- Hamilton-Jacobi-Bellman equation.
- Theory of ordinary differential equations.
- The Pontryagin maximum principle.
- Linear quadratic optimization.
- Infinite horizon optimal control problems.
- Model predictive control.
- Numerical methods for optimal control problems.

## 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.

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

## 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.