



# EL2520 Control Theory and Practice, Advanced Course 7.5 credits

Reglerteknik, fortsättningskurs

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

## Establishment

On 06/16/2021, the Head of the EECS School has decided to establish this official course syllabus to apply from spring semester 2021, registration number J-2020-1805.

## Grading scale

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

## Education cycle

Second cycle

## Main field of study

Electrical Engineering

## Specific prerequisites

## Language of instruction

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

## Intended learning outcomes

On completion of the course, the student should be able to

- formulate basic theory and definitions of important concepts in multivariable control
- apply analysis and design methods in multivariable control.

## Course contents

The course introduces basic theory and methods for analysis and design of advanced multi-variable control systems.

- Basic properties of multivariable linear dynamic systems, such as poles, zeros, system gain, input and output directions
- Calculation of signal norms and system gain
- Analysis of stability with the Small Gain Theorem
- Analysis of feedback systems in terms of critical transfer functions, such as the sensitivity function and the complementary sensitivity function.
- Quantification of fundamental limitations in feedback control systems
- Modelling of uncertainty and analysis of robust stability in feedback systems
- Analysis of interactions and design of decentralised control structures based on the Relative Gain Array
- Design of LQG optimal controllers, effect of design parameters on properties of the closed loop system
- Design of  $H_2$  and  $H_\infty$ -optimal controllers, effect of choice of weights on properties of the closed loop system
- Strategies for anti-windup to handle limitations in control inputs
- Basic principles behind Model Predictive Control

## Examination

- LAB2 - Laboratory Work, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 1.5 credits, grading scale: P, 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.