EL2620 Nonlinear Control 7.5 credits

Olinjär reglering

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

Establishment

The official course syllabus is valid from. autumn semester 2026 as decided by the Director of First and Second Cycle Education. Decision date: 2026-04-10

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

Knowledge in control engineering 6 credits corresponding to completed course EL1000/EL1010/EL1020/EL1110/EL1120.

Intended learning outcomes

After passing the course, the student should be able to:

1. model and analyze nonlinear dynamic systems that arise in engineering and applied scientific fields, such as mechanics, robotics, biological or epidemiological systems, and network systems, using appropriate mathematical representations and stability concepts

2. apply methods for nonlinear control systems and observer design – including Lyapunov-based methods, feedback linearization, passivity, and high-gain control and sliding mode control – to analyze stability and achieve desired control or management

3. use simulation tools to evaluate the behavior of nonlinear systems and control solutions, and critically reflect on model assumptions and limitations and communicate conclusions.

Course contents

The course covers control theory for nonlinear dynamic systems, including:

- analysis of input and output stability, for example with the low-gain theorem and the circle criterion

- stability analysis of equilibrium points through linearization and Lyapunov methods

- analysis of stability of passive systems

- design and analysis of closed-loop control for nonlinear systems through linearization, feedback linearization and Lyapunov-based methods

- design and analysis of sliding mode control

- observers for nonlinear systems

- setpoint control and setpoint tracking

- simulation of nonlinear dynamic models, including examples from several scientific applications.

Examination

- INLA - Homework, 2.5 credits, grading scale: P, F
- INLB - Home work, 2.5 credits, grading scale: P, F
- TENT - Written exam, 2.5 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.

Transitional regulations

The expiration module LABA can be examined through new module INLA.

The expiration module lab can be examined through new module INLB.

The expiration module LABC can be examined through new module INLB.

The expiration module TENA can be examined through new module TENT.

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.