FEL3210 Multivariable Control 8.0 credits

Flervariabel Reglering

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

Establishment

Course syllabus for FEL3210 valid from Autumn 2024

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Language of instruction

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

Intended learning outcomes

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

- describe and explain the general principles for analysis and synthesis of linear multivariable robust control systems.

- derive fundamental limitations in feedback systems based on interpolation constraints and analytic constraints on closed-loop transfer-functions
- model uncertainty in linear dynamic systems using model sets
- analyze robust stability and robust performance of multivariable feedback systems with respect to structured and unstructured uncertainty
- quantify the achieveable control performance for a given system
- design/synthesize multivariable controllers for robust performance
- contribute to the research front in the main areas covered by the course
- describe how multivariable robust control can serve as a basis for sustainability by enabling optimal system consumption, e.g., energy usage, under uncertainty

Course contents

Multivariable frequency response analysis, directionality in MIMO systems (SVD), input-output controllability, uncertainty models, linear fractional transformations, robustness analysis including the structured singular value, mu-synthesis, H2- and H-infty controller synthesis, H-infty loop shaping, Glover-MacFarlane robust loopshaping, control structures including decentralized control, gap metrics, linear matrix inequalities, Integral Quadratic Constraints

Course structure

Lectures and compulsory homeworks, take-home exam

Course literature

Skogestad and Postlethwaite, Multivariable Feedback Control, 2nd Ed., Wiley, 2009
Supplementary: Zhou, Doyle and Glover, Robust and Optimal Control, Prentice Hall, 1996

Examination

- EXA1 - Examination, 8.0 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.

For passing grade at least 80% score on all homeworks and at least 70% score on exam

Other requirements for final grade

Passing grade on all homeworks and take-home exam

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.