# Automatic Control, Advanced Course

Programme course

6 credits

Reglerteknik, fk

TSRT06

Valid from: 2017 Spring semester

**Determined by**
Board of Studies for Mechanical Engineering and Design

**Date determined**
2017-01-25

## Main field of study
Electrical Engineering, Mechanical Engineering

## Course level
Second cycle

## Advancement level
A1X

## Course offered for
- Mechanical Engineering, M Sc in Engineering
- Energy-Environment-Management

## Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

## Prerequisites
Automatic Control

## Intended learning outcomes
The aim of the course is to give knowledge in basic stability analysis of nonlinear systems and analysis and design of multivariable feedback control systems. The aim of the course is also give knowledge and skill in using modern software tools within these areas. This means that students will be expected to be able to do the following after completing this course:

- Use the Nyquist criterion to carry out stability analysis of linear feedback systems.
- Determine stationary point, linearize, and carry out stability analysis of nonlinear systems given in state space form.
- Perform stability analysis of nonlinear feedback control systems using the circle criterion and the describing function method.
- Describe the requirements and limitations in construction of multivariable feedback control systems.
- Derive models of load and measurement disturbances and combine these models with system models.
- Using relevant software tools construct multivariable feedback control systems using LQ-optimization and Kalman filter, and for low order problems carry out the design by hand.

## Course content
Nyquist curves and the Nyquist criterion. Analysis of nonlinear systems. Linearization. Describing function. Multivariable linear systems. Disturbances and Kalman filters. Limitations in feed-back control. Decoupling controllers. LQG-control.

## Teaching and working methods
The course consists of lectures, lessons and laboratory work.
The course is offered twice during 2016; Vt1 and Ht2.

## Examination

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|---|---|---|---|
| LAB1 | Computer assignments | 1.5 credits | U, G |
| DAT1 | Written examination. At-computer examination | 4.5 credits | U, 3, 4, 5 |

## Grades
Four-grade scale, LiU, U, 3, 4, 5

## Other information
Supplementary courses: Automatic Control - Project Course

## Department
Institutionen för systemteknik

## Director of Studies or equivalent
Johan Löfberg

## Examiner
Johan Löfberg

## Course website and other links
http://www.control.isy.liu.se/student/tsrt06/

## Education components
Preliminary scheduled hours: 64 h
Recommended self-study hours: 96 h

# Course literature

## Additional literature

### Books

Glad T, Ljung L, *Reglerteori. Flervariabla och olinjära metoder*

# Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.