Linnæus University

Course syllabus

Faculty Board of Science and Engineering
School of Computer Science, Physics and Mathematics

2ED013 Reglerteknik, 7,5 högskolepoäng
Automatic control, 7.5 credits

Main field of study
Electrical Engineering

Subject Group
Electrical Engineering

Level of classification
First Level

Progression
G2F

Date of Ratification
Approved by Organisational Committee 2009-12-01

The course syllabus is valid from autumn semester 2010

Prerequisites
At least two years of study in electrical engineering (120 hec) incl. the course 1ED062 Analogue signals and systems (7.5 hec) or the equivalent.

Expected learning outcomes
Upon completition of the cours the student should:

- be able to make a mathematical model for a simple dynamical system
- be able to make a stability analysis for an open system and for a closed control system
- understand and be able to make specifications for a control system in both the time domain and in the frequency domain
- be able to make reasonable estimates of a transient response and the steady-state response based on the pole-placement of the closed system or on the Bode diagram for the open system
- master the design methods: pole-placement, lead-lag compensation, feed-forward and cascade compensation
- based on a block diagram be able to simulate the behavior of the system in the time domain. Process parameters should be accessible and possible to alter. Different process variables should be possible to study.

Content
All treated dynamical systems are time continuous and time invariant. With a few exceptions, they are all linear.

Introduction to automatic control: history, examples of control system and basic concepts of automatic control.
Modeling of dynamical system using time invariant ordinary differential equations. Linearization, state-space model, weighting function, Laplace transform, transfer function, Nyquist- and Bode diagram.
Analysis of dynamic system. Concepts of stability. Analysis of stability using Root locus, Routh-Hurwitz criterion,the principle of the argument and the Nyquist criterion. Gain margin and phase margin.
Synthesis of control systems. Specifications, pole-placement, lead-lag compensation, PID-controller, feed forward, cascade compensation, robustness, sensitivity for disturbances and changes in parameters.

Type of Instruction

Teaching consists of lectures, practical work and laborations. Practical work is carried out in groups. Attendance at some activities may be mandatory.

Examination

The course is assessed with the grades U,3,4 or 5.
On request, students may have their credits translated to ECTS-marks. Such a request must be sent to the examiner before the grading process starts.
Assessment of the student's performance is made through written examination and/or assignments which are presented orally and/or in written form. The assessment method is decided at the start of the course.
Students who do not pass the regular examination are given the opportunity to do a resit examination shortly after the regular examination.

Course Evaluation

A written course evaluation will be carried out at the end of the course in accordance with the guidelines of the University. The course evaluation will be filed at the department.

Other

Upon request, a Swedish University degree will be issued upon successful completion of the full demand for that degree.
Students who receive a passing grade in the course may download a course certificate through the Student Portal. Otherwise they may request a course certificate from the school secretary.

Required Reading and Additional Study Material

Required reading
Lennartson Bengt, *Reglerteknikens grunder*, Studentlitteratur, 2000, Edition 4, 2002. Pages 513.

Required reading
This literature will be used if the course is given in English.
G. F. Franklin, J. D. Powell, and A. Emami-Naeini. Feedback Control of dynamic systems. Addison-Wesley, sixth edition, 2009. Pages 340.