Course syllabus

Faculty of Technology

Department of Physics and Electrical Engineering

2ED313 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 Faculty of Technology 2014-10-03
The course syllabus is valid from autumn semester 2015

Prerequisites
Electrical engineering 120 credits incl. Analogue signals and systems 7.5 credits (1ED062) or the equivalent.

Objectives

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 A, B, C, D, E, Fx or F.
The grade A constitutes the highest grade on the scale and the remaining grades follow in descending order where the grade E is the lowest grade on the scale that will result in a pass. The grade F means that the student's performance is assessed as fail (i.e. received the grade F).

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

Credit Overlap

The course cannot be included in a degree along with the following course/courses of which the content fully, or partly, corresponds to the content of this course:2ED013 Automatic control, 7.5 credits

Other

Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

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.