



HE1030 Analog Electronics 8.0 credits

Analog elektronik

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

Establishment

Course syllabus for HE1030 valid from Autumn 2011

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

HE1027 Electrical Principals or equivalent

Language of instruction

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

Intended learning outcomes

The student will after the course understand analog electronic circuits and how they can be designed with components such as operational amplifiers and transistors. The student will be able to individually dimension, simulate, build and test a low frequency.

For a passing grade the student shall be able to:

- define and calculate gain, input and output impedances for amplifiers based on operational amplifiers and transistors and choose suitable amplifier configuration
- determine transfer function for frequency dependent amplifier circuits, draw bode plots (magnitude and phase) and calculate frequency bandwidth
- describe the function and explain the characteristic data for operational amplifiers, diodes and transistors
- define the concepts of feedback and explain why feedback amplifiers can be unstable
- design simple RC-oscillators with operational amplifiers
- describe current-voltage characteristics and large signal models for diodes and the bipolar and MOS type of transistors and calculate the small signal parameters for transistors and use small signal models
- verify designs with SPICE simulation program and build a prototype and by measurements evaluate the performance of analog circuits

For a higher grade the student shall be able to:

- analyze effects of offset voltage and input bias currents in operational amplifier circuits and determine if compensation is needed
- calculate stability margins for feedback amplifiers and dimension compensation networks for potentially unstable amplifiers
- create models for analog amplifiers and out of that derive gain, input and output impedance
- calculate the way the high frequency model of a transistor influence an amplifier circuit
- design multiple transistor amplifiers with transistors

Course contents

- System level properties of analog circuits. Gain, input impedance, output impedance and bandwidth.
- Operational amplifiers and the characteristics of operational amplifiers. Amplifier built with operational amplifiers. Differential amplifiers, common mode, differential mode, CMRR
- RC-filters and bode plots. Frequency response of amplifiers.
- The principle of feedback. Stability problems in feedback amplifiers. Oscillators.
- Semiconductor components, diodes and transistors. Diode circuits. Transistor amplifiers of the type CE/CS, CC/CD and differential amplifiers. Circuits for biasing.
- The transistor as a switch.
- Use of circuit simulators (Pspice) and measurements on amplifiers.

Course literature

Litteratur: Analog elektronik, Molin, Upplaga: 2
Förlag: Studentlitteratur År: 2009
ISBN: 978-91-44-05367-7

Examination

- TEN1 - Examination, 6.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Lab Work, 2.0 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.

Final grade is based on both the lab work and the examination.

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.