IE1207 Analog Electronics 6.0 credits

Analog Elektronik

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

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for IE1207 valid from Spring 2019

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

EI1110 Electrical Circuit Analysis, Extended Course or equivalent.

Language of instruction

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

Intended learning outcomes

After the course, the student should understand properties of analog electronic circuits and how these can be designed with components such as operational amplifiers and transistors. After the course the student is able to independently dimension, simulate, build and test an analog electronic circuit for low frequencies, based on a given problem or specification.

To pass, the student should be able to:

- Define and calculate gain, input - and output-impedance for operational amplifier circuits and basic transistor amplifier circuits.
- Choose appropriate amplifier topologies and dimension these to solve various types of amplifier problems.
- Find the transfer function for frequency-dependent amplifier circuits and to be able to draw the bode diagram (amplitude - and phase) and calculate cut-off frequencies.
- Describe the function and account for properties of operational amplifiers, diodes, and transistors.
- Analyse effects of the non-ideal properties of the operational amplifier in amplifier circuits.
- Define concepts using feedback. including open loop gain, closed loop gain, feedback factor and stability margins.
- Explain why instability occurs in feedback connections and calculate stability margins for amplifiers with feedback..
- Describe current-voltage diagrams and large signal models for the diode and transistors of bipolar - and MOS-type.
- Calculate small signal parameters of the transistor and use small signal models to calculate gain, input - and output-impedance for amplifiers stages with both bipolar transistors and MOS-transistors.
- Verify their designs with a SPICE simulation tool.
- Build a prototype and evaluate its performance through measurements .
- Make a written documentation of the properties of designed circuits.

Course contents

- System characteristics of analog building blocks. Gain, input- and output impedance and cut-off frequencies.
- Operational amplifier and its properties. Amplifier circuits with an operational amplifier. Differential amplifier, common mode, differential mode, CMRR.
- RC-filter and bodediagram. Frequency-dependent amplifier circuits.
- The principle of feedback. Stability problems using feedback.
- Semiconductor Components, diodes and transistors. Diode connections. Amplifier circuits with transistors such as CE-stage, CC-stage (emitter follower) and differential amplifier. Connections for working point.
- Using a circuit simulator (PSpice) and measurements on amplifier circuits.

Examination

- LAB1 - Laboratory Work, 2.0 credits, grading scale: P, F
- TEN1 - Written Exam, 4.0 credits, grading scale: A, B, C, D, E, FX, 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.

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.