Analog Electronic Circuits

Analog elektronik
8 credits

Programme course

TSEI01

Valid from: 2025 Spring semester

Determined by	**Main field of study**	
Board of Studies for Electrical Engineering, Physics and Mathematics	Electrical Engineering	
Date determined	**Course level**	**Progressive specialisation**
2024-08-28	First cycle	G1F
Revised by	**Disciplinary domain**	
	Technology	
Revision date	**Subject group**	
	Electrical Engineering	
Offered first time	**Offered for the last time**	
Autumn semester 2007		
Department	**Replaced by**	
Institutionen för systemteknik		

Course offered for

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Engineering Electronics

Prerequisites

Circuit Theory

Intended learning outcomes

After passing the course, the student is supposed to be able to

1. analyze circuits containing diodes and transistors in terms of quiescent points and superimposed signals.
2. analyze circuits based on operational amplifiers, using the ideal model, as well as using non-ideal properties. This includes how concepts like bandwidth, frequency response and (non-)linearities affect stability and resulting bandwidth in amplifier circuits with feedback.
3. build, simulate and perform measurements on simple analog circuits. Also be able to stabilize amplifiers.
4. analyze, dimension, simulate, verify, build, measure, and use a non-trivial analog circuit based on discrete passive components, discrete transistors and operational amplifiers.

Course content

Diodes and transistors:

- Semiconductor theory, diodes and transistors.
- Simple amplifiers based on transistors.
- Spectral properties of transistors and amplifiers. The Miller effect.
- Input and output impedances as well as distortion.

Operational amplifiers:

- The ideal model and non-ideal models of operational amplifiers.
- Bode och Nyquist diagrams, feedback and stability. Piecewise linear models.
- Properties of operational amplifiers. Common mode and differential mode voltage, CMRR, slew rate, raw amplification, bandwidth, offset voltage and bias current.
- Realization of operational amplifiers. Differential amplifiers, current mirrors, drivers.
- Basic linear and non-linear circuits based on operational amplifiers.

Laborations:

- Simulating properties of analog circuits in terms of time and frequency.
- Construction of analog circuits.
- Verifying the function of analog circuits, and if needed, searching and correcting errors.
- In practice, to apply the above listed theoretical insights about transistors and operational amplifiers.

Teaching and working methods

Lectures, lessons and laboratory lessons

Examination

TEN2	Written examination	4 credits	U, 3, 4, 5
LAB2	Laboratory work	4 credits	U, G

Grades for examination modules are decided in accordance with the assessment criteria presented at the start of the course.

Grades

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

Other information

Supplementary courses: Computer Aided Design of Electronics Analog Design, second course

About teaching and examination language

The teaching language is presented in the Overview tab for each course. The examination language relates to the teaching language as follows:

- If teaching language is “Swedish”, the course as a whole could be given in Swedish, or partly in English. Examination language is Swedish, but parts of the examination can be in English.
- If teaching language is “English”, the course as a whole is taught in English. Examination language is English.
- If teaching language is “Swedish/English”, the course as a whole will be taught in English if students without prior knowledge of the Swedish language participate. Examination language is Swedish or English depending on teaching language.

Other

The course is conducted in such a way that there are equal opportunities with regard to sex, transgender identity or expression, ethnicity, religion or other belief, disability, sexual orientation and age.

The planning and implementation of a course should correspond to the course syllabus. The course evaluation should therefore be conducted with the course syllabus as a starting point.

The course is campus-based at the location specified for the course, unless otherwise stated under “Teaching and working methods”. Please note, in a campus-based course occasional remote sessions could be included.