

*Course syllabus*

# Analog elektronik Analogue Circuits

**ESSF01, 8 credits, G2 (First Cycle)**

**Valid for:** 2023/24

**Faculty:** Faculty of Engineering, LTH

**Decided by:** PLED E

**Date of Decision:** 2023-04-11

## General Information

**Main field:** Technology.

**Compulsory for:** E2

**Elective for:** N3

**Language of instruction:** The course will be given in Swedish

## Aim

The course is the starting point of the path towards design and development of analogue circuits like amplifiers, oscillators, mixers, AD-converters etc. It is the base for the courses Basic Wireless Communication Technique, RF Amplifier Design, Analogue IC-design and Integrated Radio Electronics. Further the course is useful for the project courses Analogue Projects and IC Projects.

Knowledge in linear systems and semiconductor physics are used. The course also presents interesting applications within control theory.

## Learning outcomes

*Knowledge and understanding*

For a passing grade the student must

- Gained general understanding in feedback theory and the benefits of negative feedback amplifiers to the extent that it is possible to select an amplifier topology and be able to determine how the ideal parameters will degrade when implemented using real components.
- Be familiar with the transistor and the different transistor stages and their characteristics, and thereby be able to decide what stages a multi-stage implementation needs to meet a given specification.

- Be familiar with the frequency dependence of active and passive components and master methods for bandwidth estimation and frequency compensation, to achieve desired frequency behaviour.

#### *Competences and skills*

For a passing grade the student must

- From a given specification be able to design an amplifier that fulfils specifications on bandwidth, step response and accuracy, by calculating and implementing an ideal amplifier topology using at most three stages.
- Be able to make a frequency and time domain analysis of a circuit from a set of measured values and a schematic.

#### *Judgement and approach*

For a passing grade the student must

- Be able to describe and discuss feedback theory applied on analogue building blocks in negative feedback amplifiers for both small and large signals.

## Contents

Amplifiers are used in many areas for example in mobile phones, signal conditioning, medicine equipment and in computers. The course gives a systematic method with which an optimal amplifier may be designed. The course also includes both a written and oral presentation of a project result.

The student is asked to write a brief reflection on the education.

## Examination details

**Grading scale:** TH - (U,3,4,5) - (Fail, Three, Four, Five)

**Assessment:** Examination consists on four parts: Written exam, project, hand-ins and laboratory work. To be allowed to write the exam, the project must be approved. The grade is based on the result on the exam. There are two re-exams, but the laboratory sessions are only given once a year.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

#### **Parts**

**Code:** 0118. **Name:** Written exam.

**Credits:** 4. **Grading scale:** TH. **Assessment:** Written exam.

**Code:** 0218. **Name:** Project Work.

**Credits:** 3. **Grading scale:** UG. **Assessment:** Approved project. **Contents:** Project

**Code:** 0318. **Name:** Assignments.

**Credits:** 0,5. **Grading scale:** UG. **Assessment:** Approved Assignments **Contents:** Assignments

**Code:** 0418. **Name:** Laboratory Work.

**Credits:** 0,5. **Grading scale:** UG. **Assessment:** Approved Laboratory work. **Contents:** Laboratory work

## Admission

**Assumed prior knowledge:** ESS010, EITA35 or ETIA01 Electronics.

**The number of participants is limited to:** No

**The course overlaps following course/s:** ESS020

## Reading list

- Gray, Hurst, Lewis, Meyer: Analysis and Design of Analog Integrated Circuits. Wiley , ISBN: 978-0-470-39877-7.
- Exercise material including lab instructions and datasheets.

## Contact and other information

**Course coordinator:** Universitetslektor Markus Törmänen,  
markus.tormanen@eit.lth.se

**Course homepage:** <http://www.eit.lth.se/course/essf01>

**Further information:** The course is part of a coherent track of courses in the Electrical Engineering programme. See the web page for the EE programme for a full description.