LUND UNIVERSITY

LTH
FACULTY OF ENGINEERING

*Course syllabus*

# Krets- och mätteknik
# Circuits and Measurements

## EITA40, 7,5 credits, G1 (First Cycle)

**Valid for:** 2023/24
**Faculty:** Faculty of Engineering, LTH
**Decided by:** PLED E
**Date of Decision:** 2023-04-11

## General Information

**Compulsory for:** IDA1, IEA1
**Language of instruction:** The course will be given in Swedish

## Aim

Our society is becoming increasingly more digital and new products are constantly being developed which are equipped with electronics to enable communication and information transfer between products. Typically, these products contain a digital computer system but also analog electrical circuits are used for certain functions. A common case where analog circuits are used is when measuring physical quantities. The analog circuits are needed to condition electrical signals from sensors before signals can be transfered to digital computer systems.

The purpose of this course is to provide basic knowledge and practical experience for analysis, design and verification of analog electrical circuits.

## Learning outcomes

*Knowledge and understanding*
For a passing grade the student must

- have knowledge of the function of passive components in DC and AC circuits
- have knowledge of methods used for analyzing DC and AC circuits
- have an understanding of how instruments can affect results from measurements.
- have basic knowledge of amplifiers and filters.

*Competences and skills*
For a passing grade the student must

- be able to calculate currents, voltages and power in a circuit consisting of sources and passive components during stationary and transient time cycles.
- be able to plan and carry out measurements of electrical quantities in a circuit and report the results in the form of a report.
- be able to dimension an amplifier circuit based on a given relationship between input and output signal.
- be able to analyze different types of filters.

*Judgement and approach*
For a passing grade the student must

- evaluate and assess the reasonableness of results obtained from analysis and measurements of electrical circuits.
- show understanding of under which conditions different methods can be used to analyze electrical circuits.

## Contents

*Concepts*

- Current, voltage, resistance and power
- Impedance, reactance, apparent power, average power, reactive power
- Direct and alternating sources
- Sinusoidal time dependency, phasor diagram
- Transfer function, Bode plot

*Circuit Analysis*

- Ohm's Law and Kirchhoff's laws
- Thévenin and Norton equivalent circuits
- Nodal analysis, superposition
- Complex method
- Charge and discharge of capacitor and coil

*Components*

- Resistor, capacitor, coil, ideal operational amplifier

*Measurement technique*

- Volt and ampere meter, oscilloscope, function generator
- The influence of the measurement instrument

*Applications*

- Amplifiers circuits with the operational amplifier
- Passive filters

## Examination details

**Grading scale:** TH - (U,3,4,5) - (Fail, Three, Four, Five)
**Assessment:** Written exam for grade 3, 4 or 5. Passed laboratories and laboratory reports is a requirement to pass the course.

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:** 0117. **Name:** Written Examinations.

**Credits:** 5,5. **Grading scale:** TH. **Assessment:** Written examination. **Further information:** Written examination. The final grade of the course is based on the result of this exam.

**Code:** 0217. **Name:** Laboratory Work.

**Credits:** 2. **Grading scale:** UG. **Assessment:** Passed laboratory experiments and laboratory experiment report.

## Admission

**Assumed prior knowledge:** FMA645/FMAA50 Calculus: Part Algebra and Calculus 1
**The number of participants is limited to:** No
**The course overlaps following course/s:** ETE602, ETE603, ETE604

## Reading list

- Kurslitteratur beslutas senast 3 mån innan kursstart och meddelas på kurshemsidan.

## Contact and other information

**Course coordinator:** Johannes Svensson, johannes.svensson@eit.lth.se
**Course homepage:** http://www.eit.lth.se/course/eita40