



# El1110 Electrical Circuit Analysis, Extended Course 9.0 credits

Elkretsanalys, utökad kurs

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

The official course syllabus is valid from the autumn semester 2022 in accordance with Head of School decision: J-2021-1856. Decision date: 14/10/2021

## Grading scale

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

## Education cycle

First cycle

## Main field of study

Technology

## Language of instruction

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

## Intended learning outcomes

After passing the course, the student shall be able to

- solve problems in electrical circuit analysis by setting up a computational model, choose appropriate method, make proper approximations, formulate and solve necessary equations and evaluate the result in order to solve for quantities in linear electric circuits
- evaluate electrical circuits based on a sustainability perspective.

For higher grades, the student should in addition be able to, with progression in both completeness and scope, solve problems from the whole course content.

## Course contents

1. Basic components, voltage and current sources (independent and dependent). Ohm's law and Kirchhoff's laws. Analytical methods including nodal analysis, mesh analyses, superposition and graphical methods.
2. Two pole equivalents (Thevenin and Norton equivalents).
3. Operational amplifiers.
4. Transient switching including equilibrium and continuity. Time dependent quantities in dynamic circuits.
5. Complex numbers. Alternating current and time harmonic signals analysed with the complex method (the "j omega-method"). Impedances.
6. Complex power. Active, reactive and apparent power. The Tellegen theorem. Matching, phase compensation and power factor.
7. Inductive coupling and transformers.
8. Filter circuits and Bode diagrams/plots.
9. Three-phase systems and balance in such systems.
10. Sustainability issues from a circuit analysis perspective. These include, but need not be limited to, design and choice of materials and recycling.
11. Applications. The course CDIO-elements include dimensional analysis and to design, dimension and create basic circuits, under the concept "Conceiving", with introductory elements of "Designing".

## Specific prerequisites

### Examination

- LAB1 - Laboration 1, 1.0 credits, grading scale: P, F
- LAB2 - Laboration 2, 1.0 credits, grading scale: P, F

- TEN1 - Examination 2, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN2 - Examination 2, 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.