



# El1110 Electrical Circuit Analysis, Extended Course 9.0 credits

Elkretsanalys, utökad kurs

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

## Establishment

Course syllabus for El1110 valid from Autumn 2011

## Grading scale

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

## Education cycle

First cycle

## Main field of study

Technology

## Specific prerequisites

Pre-university physics and technology courses, and introduction to mathematics at KTH or similarly.

Basic concept that is assumed that student is familiar with: current, potential, voltage, resistance, power. Ohms law, Kirchhoff's laws. Linear differential equations with constant coefficients. Complex numbers: polar and Cartesian form, algebraic operations, conjugation.

From experience we know that many students have forgotten a part of circuit theory and have hence developed a repetition booklet, with a number of tasks to refresh the knowledge.

The booklet is located on the course web page. **To the first** class the student is expected to have solved the problems in this booklet.

## Language of instruction

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

## Intended learning outcomes

After completion of the course the student shall be able to

- Use and choose mathematical model in order to calculate basic electric quantities like voltage, currents and power in linear ac/dc-electrical circuits, including basic three phase circuits, and transient effects, as well as for sources of more general character like e.g. triangular waves.
- Know and state basic quantities e.g., like circuit impedance, describe a diodes function, phase difference between two currents etc. furthermore, be able to identify properties of circuits and to apply methods that reflect linearity, non-linearity, dc or ac-voltage, transient or filter functions.
- Analyze and explain a circuit's properties by separation of different temporal parts, e.g. stationary properties, and transient properties. Furthermore to calculate the entire response from a circuit, from stationary to transient and back to stationary state. The student should show that tools like equivalent circuits and matching are a part of their analyzing toolbox.
- Construct analogous circuits for simpler tasks like filtering, voltage division etc. with limitations on e.g. the required power consumption. Dimensional analysis and plausibility test on electrical circuit results.
- On breadboard, or similar, construct a circuit and to electrically measure both to verify own calculations and to find possible sources of errors in the physical circuit.

## Course contents

Ohms and Kirchhoff's laws. Analyzing methods, including node analysis, mesh analysis, superposition, and graphical methods. Transients. Alternating currents (ac) analyzed with a complex simplified Fourier-transform method, and basic three phase system. Complex power. Matching. Filter. Inductive coupling. Operational Amplifiers. Applications. The CDIO elements includes dimensional analysis, and to construct, dimensionalize and create simpler circuits, which falls under the concept, "Conceiving", with elements of a beginning to "Design".

## Disposition

The course consists of lectures, exercises, homework's/projects and laborations. To participate in the course you have to register. The course is based on solving many problems and

this requires that the student solves a large amount of exercises. Choice of solution method and making the required calculations requires frequent practice.

## Course literature

Preliminärt: Petersson: "Elkretsanalys" alternativt Dorf/Svoboda: "Introduction to Electric Circuits", kurslitteraturen är just nu under granskning och kan möjligen ändras fram till kursstarten. Det slutgiltiga valet av kurslitteratur kommer att uppges på kursens hemsida.

## Examination

- PRO2 - Project 2, 1.0 credits, grading scale: P, F
- PRO1 - Project 1, 1.0 credits, grading scale: P, F
- TEN2 - Written examination, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Written examination, 3.0 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.

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

The course is given as two parts. A 4hp part in period 1 and a 5hp part in period 3. To each part there are project tasks and a written exam. The project tasks are pass/fail and the exam is has grades A\_F. Final grade requires that the projects are finalized and consist of a weighted average of the two written exam explicitly explained in the course pm.

## Other requirements for final grade

Passing the exam, passing project tasks.

## 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.