

**SYLLABUS**

# **Electrical Circuits and Power Networks 7.5 credits E0016E**

**Elektriska kretsar och elnät**

**Course syllabus admitted: Autumn 2023 Sp 1 - Present**

**DECISION DATE  
2023-02-15**

# Electrical Circuits and Power Networks 7.5 credits E0016E

## Elektriska kretsar och elnät

### First cycle, E0016E

Education level	Grade scale	Subject	Subject group (SCB)
First cycle	G U 3 4 5	Elektroteknik	Electrical Engineering

### Main field of study

Engineering Physics and Electrical Engineering, Energy Engineering

## Entry requirements

In order to meet the general entry requirements for first cycle studies you must have successfully completed upper secondary education and documented skills in English language and At least 60 credits in completed courses, of which 15 credits of mathematics including linear algebra, ordinary linear differential equations, complex numbers, e.g. M0051M Integrals, Vectors and Matrices, 7.5 credits and M0052M Differential Equations and Transform Theory, 7.5 hp.

Good knowledge in English, equivalent to English 6.

## Selection

The selection is based on 1-165 credits.

## Course Aim

After the course, the student will be able to analyse analog linear circuits. This includes the basic knowledge of components and their constitutive relations, as well as different methods for the analysis of DC and AC circuits.

After the course the student should possess knowledge of constitutive relations for basic electrical components and, based on that knowledge, be able to apply knowledge of mathematics to analytically solve electric circuit problems.

The student should independently be able to analyse and evaluate analog linear circuits. This is demonstrated by laboratory experiments, simulation exercises, and through homework assignments and a written exam.

The student should independently be able to analyze and minimize transmission losses, in particular in linear AC circuits with inductive loads, and to be able to describe the link to environmentally sound electrical power distribution and sustainable development.

## Contents

### *Fundamentals of electric circuits*

Features of electrical networks and circuits; Charge, current, voltage, and power; Sources; Kirchoffs laws and sign conventions; Ohms law and resistance; Node and mesh analysis methods

### *Network theorems*

Resistors in series and parallel, voltage and current dividers; Pi and T networks; Linear networks and superposition; Thevenin and Norton equivalents; Maximum power transfer; Measurements and introduction to nonlinear elements

### *Transient analysis*

Elements of transient analysis; First and second order transient analysis; RL - RC - RLC circuits

### *AC analysis*

Complex quantities; Phasors; Impedance and AC circuit analysis; Instantaneous and average power; Complex power; Power triangle and power factor

### *Frequency response and systems*

Frequency response; Fourier analysis; Filter circuits, resonance and quality factor; Bode plots

### *Electric power systems*

Three-phase systems; three-phase power generation; three-phase power measurement; transformers; symmetrical components

## Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

The scheduled teaching consists of lectures and mandatory simulation exercises and labs in laboratory rooms. Students are expected to complete a number of mandatory exercises with support of the course material, which are reported prior to simulation/laboratory work.

## Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided. The examination consists of two parts:

- Theoretical understanding is examined through a written exam with differentiated grades.
- Practical as well as theoretical understanding is examined through presentation of completed simulation and laboratory assignments as well as preparatory exercises of theoretical character.

## Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

## Remarks

Can not be used in a diploma together with E0013E or E0003E.

## Course offered by

Department of Computer Science, Electrical and Space Engineering

## Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0001	Laboratory work	U G#	3	Mandatory	A23	
0002	Written exam	G U 3 4 5	4.5	Mandatory	A23	

## Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

## Syllabus established

by Robert Brännström 2023-02-15