

Electrical Systems

Programme course

6 credits

Eltekniska system

TMEL08

Valid from: 2017 Spring semester

Determined by

Board of Studies for Mechanical
Engineering and Design

Date determined

2017-01-25

Main field of study

Energy and Environmental Engineering, Mechanical Engineering

Course level

First cycle

Advancement level

G2X

Course offered for

- Energy-Environment-Management M Sc in Engineering
- Mechanical Engineering, M Sc in Engineering

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

Linear algebra and calculus.

Intended learning outcomes

Electricity as a power source and information carrier is necessary for our modern society to function. The course treats the basics of these electrical systems, both theoretically and practically. The basic electronic components are treated as well as how measurements of non-electrical quantities can be made through electrical methods. The course will give the knowledge to understand and deal with electrical and electronic problems at home and in industry. Therefore the student should be able to:

- Make calculations on DC- and AC-circuits.
- Understand the function and make easier calculations at electromagnetic connections.
- Use structured methods for analysis and construction of electronic circuits.
- Make measurements on electrical quantities as voltage, current, power etc.
- Chose suitable sensors and measuring methods to (in an electrical way) measure non-electrical quantities like speed of revolution, force, temperature, pressure etc.

Course content

- Direct current and alternating current.
- Voltage, current and power.
- Ohm's law and electric resistance.
- Serial and parallel connection.
- D/Y- and Y/D-transformation.
- Kirchhoff's laws.
- Superposition. Thévenin's and Norton's theorem.
- Mesh current and node voltage method.
- Sinusoidal alternating current, phasor diagram and the complex method.
- Power in alternating current circuits.
- Magnetism and the ideal transformer.
- Transients treated with the Laplace transform.
- The diode and the Zener diode.
- Rectifying and smoothing.
- The transistor and its operating point.
- Small signal models and basic amplifier stages.
- The Operational amplifier.
- Frequency dependence and Bode plots.
- How to use electricity for measuring non-electrical quantities like with laborations on air flow, temperature, pressure in an heat exchanger and measurements of time, frequency, speed of revolution, force and vibration.

Teaching and working methods

Lectures, tutorials and laboratory work

Examination

TEN1	Written examination	4 credits	U, 3, 4, 5
LAB1	Laboratory Work	2 credits	U, G

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses: Energy Technical Systems, Switching Circuits and Logical Design, Automatic Control

Department

Institutionen för systemteknik

Director of Studies or equivalent

Tomas Svensson

Examiner

Sivert Lundgren

Course website and other links

<http://www.isy.liu.se/edu/kurs/TMELo8/>

Education components

Preliminary scheduled hours: 64 h

Recommended self-study hours: 96 h

Course literature

Söderkvist: Kretsteori & Elektronik. Ekdahl/Franzén/Gralén/Lundgren:
Elektroteknik Övningsexempel. Franzén/Lundgren/m.fl.: Laborationer

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.