Electrical and Energy Technology

Programme course

6 credits

Energitekniska system

TSFS11

Valid from: 2017 Spring semester

Determined by
Board of Studies for Mechanical Engineering and Design

Date determined
2017-01-25

Offered for the last time
Spring semester 2025

Main field of study
Mechanical Engineering

Course level
First cycle

Advancement level
G2F

Course offered for
- Energy-Environment-Management
- Mechanical Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, 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
Electrical systems

Intended learning outcomes

The overall aim is to provide overall knowledge of the energy system with emphasis on the electrical system. In the end of the course the student should know about how to:

- explain and understand how the electrical grid is constructed and controlled
- explain and understand critical stability issues and the how safe operation is maintained
- perform calculations on three-phase power transfer and draw equivalent per-phase-circuits
- perform calculations on phase-compensation of reactive loads
- perform calculations on symmetrical and unsymmetrical three phase systems
- perform calculations on three phase power transformer
- describe the principle function and perform calculations of different electrical machines such as
    - Asynchronous machine
    - DC-machine
    - Synchronous machine
- perform calculations in power electronics with thyristors and diodes and regulators
- explain and understand the principles of different battery-technologies and what the implications for the end user is.

Course content

The course will give basic knowledge about energy systems and examples of technical applications in various areas. The principles of different kinds of equipment in the power and heating areas will be treated. Here electric power has a central role.

- Three phase systems and calculations (phase diagrams, synchronous generator, the jw-method etc.)
- Single- and three-phase transformers
- DC machine (machine types, electromechanical relationships, speed-control, efficiency and losses)
- Asynchonous machine (structure, electromechanical relationsips, efficiency and losses)
- Power electronics (rectifiers, diodes, thyristors, inverters)

Using the above as foundation, technical areas that are relevant from an energy perspective will be studied.

- Energy conversion
- Batteries
- Charging
- "Smart grid"
- Infrastructure

Teaching and working methods
Lectures, tutorials and laboratory work.

Examination

LAB1	Laboratory work	1.5 credits	U, G
TEN1	Written examination	4.5 credits	U, 3, 4, 5

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

Department
Institutionen för systemteknik

Director of Studies or equivalent
Johan Löfberg

Examiner
Per Öberg

Course website and other links

Education components
Preliminary scheduled hours: 54 h
Recommended self-study hours: 106 h

Course literature
"Elkraft" av Alf Alfredsson, ISBN 978-91-10057-6, Liber Laborationshandledning.

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://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.