EI1360 Electric Power Engineering II 7.5 credits

Elkraftteknik II

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-2021-1916. Decision date: 14/10/2021

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Knowledge in basic power engineering, 8 higher education credits, equivalent to completed course EI1230.

Knowledge in transform methods, 8 higher education credits, equivalent to completed course HF1011.

Active participation in a course offering where the final examination is not yet reported in LADOK is considered equivalent to completion of the course.

Registering for a course is counted as active participation.

The term 'final examination' encompasses both the regular examination and the first re-examination.

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

- decide appropriate choices of components in power systems and facilities including calculation of load and fault currents with consideration also to safety and the electromagnetic environment

- for sources and loads such as solar energy, battery storage, drive systems, electrical vehicles and illumination, give an account of the basic characteristics, discuss typical parameters and make common types of calculations

- carry out practical work. For example to examine the properties of a motor in the laboratory and to decide appropriate connection and setting for a motor with associated control equipment and then to carry it out correctly, safely and neatly.

- discuss how power engineering now and in the future supports a sustainable energy system and some existing sustainability issues with for example power grids, sources and energy storage.

Course contents

The course includes the following subjects:

- Components and design in networks and buildings. Typical topology and dimensioning.

- Short-circuit currents. Calculation with short-circuit power and percentage impedance. Balanced and unbalanced faults in three-phase systems. Transient components in fault currents in inductive circuits and from rotating machines.

- Protection: consequences and protection principles regarding short-circuit and earth-fault currents and touch voltage.

- Power electronics with a focus on inverters for and mains connection of sources and for motor control.

- Sources: distributed generation, energy storage, backup power.

- Drive systems with motor and power electronics, focused mainly on the asynchronous motor.

- Power quality and electromagnetic environment: problems, cause, consequences, mitigation methods. The problems include voltage fluctuations, harmonics, and other disrupting frequencies and transients such as from lightning. The methods handle reduction of cause, increased hardiness, and shielding and overvoltage protection. The focus is mainly on low voltage installations.

- Rail traction vehicles and power supply systems for railways. Current design with a focus on systems in Sweden. Ongoing and future changes.

- Electrical vehicles apart other than rail: electric cars, trucks, etc Typical parameters, charging systems, handling of charging infrastructure in the power grids.

- illumination: light sources, principles of illumination in various contexts.

- Overview of laws, regulations, standard and practice in electrical safety, electromagnetic compatibility and contracts.

Examination

- LAB1 - Laboratory work, 2.0 credits, grading scale: P, F
- PRO1 - Project work, 1.5 credits, grading scale: P, F
- TEN1 - Written exam, 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.