EN2240 High-Power Electronics 7.5 credits

Högeffektelektronik

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

Establishment

The official course syllabus is valid from the spring semester 2026 as decided by the director of first and second cycle education: HS-2025-1927. Date of decision: 2025-10-14

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

Knowledge of power electronics, 6 credits, equivalent to completed course EJ2301

or

at least 3 years of professional experience in a technical role in one of the following areas:

power electronics (power electronics), electrical transmission and distribution systems (power systems), power semiconductor components.

Knowledge of English equivalent to the upper secondary school course English B/English 6.

Intended learning outcomes

After passing the course, the student should be able to

- describe the purpose, characteristics and function of components in high-power electronic systems
- summarise limitations and interpret implementation aspects of components and power converters in high-power electronic systems

in order to understand the role of these components and how they should be dimensioned to function as intended in the system.

For higher grades, the student should also be able to

- analyse the function and solve problems related to high-power converters, such as static compensators (STATCOM) and power converters for high-voltage direct current transmission (HVDC), in high-voltage direct current and alternating current networks.

Course contents

The course covers aspects of components, systems and their control for high-power electronic applications in transmission and railway networks. More specifically, the course includes:

- High-power electronic applications, their characteristics and requirements.
- Fundamentals of high-power electronic components, such as power semiconductor components, capacitors, inductors and transformers.
- Modulation for high-power converters, with a focus on multi-level technology.
- Control of high-power converters, with a focus on grid synchronization, current regulation, power regulation and grid forming.
- Circuit topologies for various high-power converters for conversion between DC and AC voltage systems and between two DC or AC voltage systems with different voltage levels.
- High-voltage DC voltage systems.
- Flexible AC voltage systems (Static Var Compensators and STATCOMs).
- Energy storage in transmission systems.
- Supply of railway networks.

Examination

- TEN1 - Written Exam, 7.5 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.

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.