IH2662 Power Semiconductor Devices 7.5 credits

Krafthalvledarkomponenter

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

Establishment

The official course syllabus is valid from the autumn semester 2025 according to the decision by the Faculty Board: J-2024-2182. Date of decision: 2024-10-08

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

Knowledge of semiconductor components corresponding to 7.5 higher education credits, being equivalent to the completed course IL2240.

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 should be able to

- discuss advantages and disadvantages with different types of semiconductor materials for power electronics
- calculate and design doping and geometry for simple component structures
- explain how external electric fields via contacts influence field distribution and charge transport inside component structures
- analyse power losses and sustainability for semiconductor power devices
- justify choice of component type for different applications.

Course contents

The course gives an overview of modern power semiconductor components and the physical basis for their function. Typical uni- and bipolar components for current and voltage regulation, as well as how new semiconductor materials influence losses and sustainability, are studied.

The course contains the following:

- Basic semiconductor physics and comparison of various semiconductor materials relevant for power electronics components.
- Basic component types and their manufacturing methods.
- Static and dynamic properties of power electronics components.
- Encapsulation, thermal properties, losses and reliability of the components.
- Practical training in component evaluation (labs).

Examination

- LAB1 - Laboratory work, 1.5 credits, grading scale: P, F
- PRO1 - Project work, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- INL1 - Hand-in assignment, 1.5 credits, grading scale: P, 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.