IH262V 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 2024 in accordance with the director of first and second cycle education's decision: J-2024-0265. Decision date: 08/02/2024

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

- Knowledge in semiconductor components corresponding to 3 credits or at least 1 year of documented experience of working with these types of components (e.g. diodes, transistors or thyristors) in power electronics.
- Knowledge in English corresponding to the upper secondary course English B/6.

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

- discuss advantages and disadvantages with different types of semiconductor materials for power electronics
- design simple component structures with regard to doping and geometry
- explain how external electric fields, via contacts, influence the field distribution and charge carrier transport inside devices
- 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 bases of their function. Typical uni- and bipolar component types for rectification and switching are treated, and how the newly developed semiconductor materials influence power losses and sustainability. The course contains the following parts:

- Basic semiconductor physics and comparison of different semiconductor materials.
- Component structures and manufacturing methods.
- Static and dynamic properties of components.
- Encapsulation of components, thermal properties, losses and reliability.
- Practical experience in component evaluation.

Examination

- LAB1 - Laboratory work, 1.5 credits, grading scale: P, F
- ÖVN1 - Excercises, 1.5 credits, grading scale: P, F
- PRO1 - Project work, 4.5 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.

Main examination consists of oral presentation and discussion of project work. Furthermore, submission of solutions to numerical problems and implementation of lab is included.

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.