HALMSTAD UNIVERSITY
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School of Information Technology

Semiconductor Devices 7.5 credits

Halvledarkomponenter 7.5 hp

Second cycle
Main field: Electronics, Second cycle, has only first-cycle course/s as entry requirements (A1N)
Syllabus is adopted by the Research and Education Board (2024-03-20) and is valid for students admitted for the autumn semester 2024.

Placement in the Academic System

The course is included in the Master's Programme in Electronics Design, 60 credits and as elective course in the Programme Computer Science and Engineering, 300 credits. The course is also offered as a freestanding course.

Prerequisites and Conditions of Admission

Bachelor of Science degree (or equivalent) in an engineering subject. Courses in electrical engineering of at least 90 credits, including thesis. The degree must be equivalent to a Swedish kandidatexamen and must have been awarded from an internationally recognised university. Courses in mathematics of at least 30 credits or including calculus, linear algebra and transform methods. English 6. Exemption of the requirement in Swedish is granted.

Course Objectives

The course objective is that the student displays a good knowledge of electrical and optical properties of semiconductor materials, as well as of key semiconductor components. A cursory understanding of fabrication methods for semiconductor devices and the WEEE directive should also be achieved.

Following successful completion of the course the student should:

Knowledge and understanding

- describe the crystal structure and electrical properties of semiconductor materials
- explain the design, physical working principles and function of basic discrete semiconductor devices
- briefly describe the most important industrial technologies for production of semiconductor devices
- briefly describe the manufacture of electronics and disposal of electronic waste in the sustainable society

Skills and ability

- propose experimental methods for basic characterization of semiconductor materials and devices.
- do basic calculations to determine physical parameters and performance of devices
- use industry-standard software to design electrical circuits for a particular task
- use prototyping techniques to test circuit designs

Judgement and approach

- discuss and question the contents of a scientific report related to semiconductor devices
- discuss the social and ethical aspects related to modern electronics production
- make judgements about electronics concerning opportunities, limitations, its role in society, as well as the responsibility of electronics developers' on how it is applied

Primary Contents

The course content covers semiconductor crystals, energy bands, charge carriers and charge transport. Diodes, bipolar transistors, field effect transistors (MOSFETs) and CMOS. Semiconductor memories. Modeling of devices. Introduction to organic electronics. Basic fabrication methods for semiconductor devices and the WEEE directive.

Teaching Formats

Teaching comprises lectures, compulsory laboratory work and exercises. The course work also includes a mandatory project assignment.

Teaching is in English.

Examination

The overall grades of Fail, 3, 4 or 5 will be awarded for the course.
The examination consists of a written exam, approved laboratory reports and passed oral and written presentation of the project assignment. All examination is carried out individually.

Name of the test		Grading
Written Examination	5 credits	U/3/4/5
Laboratory Work	1,5 credits	U/G
Project Assignment	1 credits	U/G

If there are special reasons, the examiner may make exceptions from the specified examination format and allow a student to be examined in another way. Special reasons can e.g. be a decision on learning support.

For elite sports students according to Riktlinjer för kombinationen studier och elitidrott vid Högskolan i Halmstad, DNR: L 2018/177, the examiner has the right to decide on an adapted examination component or let the student complete the examination in an alternative way.

Course Evaluation

Course evaluation is part of the course. This evaluation should offer guidance in the future development and planning of the course. Course evaluations should be documented and made available to the students.

Course Literature and Other Study Resources

Sze, S.M., Lee, M.K. *Semiconductor Devices - Physics and Technology.* John Wiley & Sons, 2012

Journal articles available through the University library.

Laboratory instructions on the course website.