IL2240 Semiconductor Devices for Integraded Circuits 7.5 credits

Halvledarkomponenter för integrerade kretsar

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 spring semester 2023 in accordance with Head of School decision: J-2021-1952.Decision date: 14/10/2021

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

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

- describe the electronic band structure for insulators, semiconductors and metals qualitatively
- use the concepts electron- and hole-concentration, bandgap and mobility for calculations of current-voltage relations in semiconductor components
- analyse and calculate the internal electrostatics (charges, electric field and potential) in semiconductor components based on pn and MOS-structures
- describe the function and the application areas for the pn-diode, the MOS-transistor and common types of memory cells and some kind of semiconductor sensor
- describe the basic properties for CMOS-inverters and how these are used to implement integrated circuits.
- give an account of the most important sustainability aspects in production of modern microelectronics.

Course contents

This course introduces the most important semiconductor components that are used in the modern electronics. We focus on the MOS-transistor, pn and schottkydiodes and different types of memory cells. Furthermore, solar cells, photodiodes and light-emitting diodes are included. In the course, power consumption and gate delay in CMOS-based circuits are discussed. An overview is given of the development of so-called technology nodes for advanced CMOS according to Moore's law. You should be familiar with the process flow that is used to produce modern microelectronics. Strong emphasis is placed on sustainability aspects such as energy consumption and finite resources.

Specific prerequisites

Knowledge in electrostatics, 3.5 higher education credits, equivalent completed examination module TENE in EI1220 or completed course EI1320/HE1200.

Examination

- LABA - Laboration, 1.5 credits, grading scale: P, F
- SEMA - Seminar, 1.5 credits, grading scale: P, F
- TENA - Written exam, 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.

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.