



LUND
UNIVERSITY

Faculty of Science

FYST78, Physics: Semiconductor Physics, 7.5 credits *Fysik: Halvledarfysik, 7,5 högskolepoäng* Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2022-12-12 to be valid from 2022-12-12, autumn semester 2023.

General Information

The course is an elective course for second cycle studies for a scientific candidate - or Master's degree (120 credits) in physics. The course is also given as a freestanding course.

Language of instruction: English
The course can be given in English.

Main field of studies

Physics

Depth of study relative to the degree requirements

A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The overall objective of the course is to provide in-depth knowledge of the fundamental physical principles needed to understand semiconductor devices and their function. The course connects to courses in solid state physics or equivalent.

Knowledge and understanding

On completion of the course, the students shall be able to:

- give an account of essential theories and models within semiconductor physics
- give an account of the operation of essential semiconductor devices based on physical principles
- discuss the performance of devices in terms of material parameters and device design

Competence and skills

On completion of the course, the students shall be able to:

- simulate and analyse devices and summarize and explain the results in a written report
- solve problems and, in written form, clearly and in a structured way describe the solutions
- compile a presentation based on literature for other students in the course
- give examples of some relevant societal aspects of semiconductor devices and semiconductor industry

Judgement and approach

On completion of the course, the students shall be able to:

- orally argue, use relevant concepts and draw conclusions in a scientific discussion.

Course content

The course covers basic physical theory of semiconductors:

- band structure, intrinsic and extrinsic semiconductors - charge carrier concentrations and transport phenomena
- non-equilibrium in semiconductors: excitation and recombination mechanisms, charge carrier injection
- understanding of key parameters of semiconductor materials
- properties and function of components such as pn junctions, metal-semiconductor junctions, transistors and solar cells.

Course design

The teaching consists of lectures, laboratory sessions and exercises. Participation in the laboratory sessions and associated elements is compulsory.

Assessment

The examination takes place in writing in the form of examination and a to this hearing oral test at the end of the course. Oral examination is given only for those students who passed the written examination. Examination is also in the form of written project work and laboratory sessions during the course.

Students who do not pass a regular assessment will be offered another opportunity for assesment soon thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.

To pass in the whole course is required approved examination passed laboratory sessions passed project assignment and an approved test. The grading scale for the written assignments is Failed, Passed, while examination is graded according to the grading scale failed, passed, Passed with distinction. The final grade is decided through the grade on the written examination.

Entry requirements

Admission to the course requires 75 credits in physics and 45 credits in mathematics, or a bachelor's degree in physics or corresponded to - in both cases including knowledge equivalent to FYSB22 Basic quantum mechanics, 7.5 credits and FYSC23 Solid State Physics, 7.5 credits, and English 6/B and general entry requirements.

Further information

This course replaces FYST15, Physics: Semiconductor physics, 7.5 credits, and cannot be included in a degree together with this course.

The course is coordinated with FFFN30, Semiconductor Physics, 7.5 hp, which is a course at Lund institute of technology, LTH.

The examination of the course is scheduled in accordance with the LTH exam schedule.

The course is offered at the Department of Physics, Lund University.

Subcourses in FYST78, Physics: Semiconductor Physics

Applies from H23

- 2301 Laboratory Exercises, 1,5 hp
Grading scale: Fail, Pass
- 2302 Written examination, 5,0 hp
Grading scale: Fail, Pass, Pass with distinction
- 2303 Project, 1,0 hp
Grading scale: Fail, Pass
- 2304 Oral examination, 0,0 hp
Grading scale: Fail, Pass