Faculty of Science

FYST15, 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 2007-03-01 to be valid from 2007-07-01, autumn semester 2007.

General Information

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

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

Main field of studies	*Depth of study relative to the degree requirements*
Physics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The course connects to the course Thermodynamics and electronic materials- or Device physics- to give a broader and more advanced knowledge in solid state physics, essential for the applications of the subject. After that, the basic physical principles that are needed to understand semiconductor devices and their functions are deepened, also within simple electronic applications.

Knowledge and understanding

On completion of the course, the student should be able to

- be able to account for the models and approximations that are introduced on the path from atom to device

- be able to account for the function of basic electronic devices- both within electric circuits and the underlying physics
- be able to analyse devices by means of computer simulations

Skills and abilities

On completion of the course, the student should be able to

- be able to analyse applications such as simple logical circuits
- be able to relate the performance of devices to materials properties
- be able to understand the problems that can arise as devices get smaller
- be able to account orally for the results of the independently completed computer project
- be able to analyse and summarise the results from laboratory sessions and simulations in written reports

Course content

Crystals, binding and lattice vibrations. Electronic structure. Basic physical theory of semiconductors: intrinsic and extrinsic semiconductors- charge carrier concentration and transport phenomena.
non-equilibrium in semiconductors: excitation and recombination mechanisms, injection of charge carriers. Surface states. Contacts. Photo conductivity.
Electrical and optical properties of structures such as pn-junctions, bipolar transistors, metal-semiconductor junctions, MOS-transistors and MESFETs, etc., integrated circuits.

Course design

The teaching consists of lectures and laboratory sessions. Participation in laboratory sessions and other teaching integrated with that, is mandatory.

Assessment

The examination consists of written assignments and an oral exam.

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.
The grades in the course are 3.4,5 or passed with distinction, Passed and failed.
Student who so want to can obtain the regular grade supplemented by ECTS grades.

Entry requirements

For admission to the course is required:

FYSA31, Physics 3, Modern physics, 30 ECTS or the equivalent.

Subcourses in FYST15, Physics: Semiconductor Physics

Applies from H16

0711 Semiconductor Physics, 5,0 hp
Grading scale: Fail, Pass, Pass with distinction
0712 Assignments, 1,5 hp
Grading scale: Fail, Pass
0713 Laboratory Exercises, 1,0 hp
Grading scale: Fail, Pass

Applies from H07

0701 Semiconductor Physics, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction