Faculty of Science

FYST71, Physics: Crystal Growth and Semiconductor Epitaxy, 7.5 credits

Fysik: Kristalltillväxt och halvledarepitaxi, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2022-06-13 and was last revised on 2026-04-27 by The Education Board of Faculty of Science. The revised syllabus comes into effect 2026-04-27 and is valid from the spring semester 2027.

General information

The course is an elective course for second-cycle studies for a Bachelor's or Master's degree (120 credits) in physics.

Language of instruction: English

Main field of study	*Specialisation*
Physics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The aim of the course is that the student, once the course is completed, has aquired knowledge to understand crystal growth and especially semiconductor epitaxy.

Knowledge and understanding

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

- explain crystal growth and epitaxy and the relevant concepts within thermodynamics and kinetics.
- explain the connection between growth parameters and growth method and the properties and quality of the result.

Competence and skills

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

- evaluate and choose an appropriate crystal growth method for a specific issue.
- orally and in writing present issues concerning crystal growth in a scientific way.

Judgement and approach

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

- reflect on the role of epitaxy in society.
- discuss how crystal growth and epitaxy can contribute to a more sustainable society.

Course content

This course treats the fundamental aspects of crystal growth, e.g. the thermodynamic prerequisites for crystal growth such as chemical potential, construction of binary phase diagrams, supersaturation, and nucleation. Further on, surface energies, surface diffusion, and Wulff's theorem are studied. In the course section on epitaxial growth surface reconstructions, lattice mismatch, and dislocations, as well as characterization – both in- and ex-situ are discussed. Growth techniques and reactor models are also dealt with. During the course, the various moments will be illuminated by examples from modern research, especially research on epitaxy of nanostructures.

Course design

The teaching consists of lectures and problem solving classes.

Assessment

Assessment takes the form of a written exam at the end of the course. Students who do not pass the regular exam are offered a new possibility during scheduled reexamination period.

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.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
To pass the entire course an approved written exam is required. The final grade is decided through the written examination.

Entry requirements

Admission to the course requires 90 credits in scientific studies, or a bachelor's degree in physics, chemistry or equivalent - in both cases including a course that contains at least 2.5 credits thermodynamics. Furthermore is required English 6/B.

Further information

The course replaces FYST35 Physics: Crystal Growth and Semiconductor Epitaxy, 7.5 credits, and cannot be counted in a degree together with this course.

Prior knowledge equivalent to FYST81, Physics: Nanomaterials - Thermodynamics and Kinetics, 7.5 credits is recommended.

The course is entirely co-read with FAFN15, Crystal Growth and Semiconductor Epitaxy, 7.5 credits, which is a course at the Faculty of engineering, LTH. The examination of the course is scheduled in accordance with LTH's examination schedule.

The course is given by the Department of Physics, Lund University.