Faculty of Science

FYSD21, Physics: Materials Analysis at the Nanoscale, 7.5 credits

Fysik: Analys på nanoskalan, 7,5 högskolepoäng

First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2015-12-17 to be valid from 2016-01-01, spring semester 2016.

General Information

The course is included in the main field of study physics at the Faculty of Science. The course is an elective course for second cycle studies for a scientific Bachelor's or Master's degree in physics.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Physics	G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The goal of the course is that the student should acquire active fundamental knowledge on available methods for imaging and analysis of the structure and chemical composition at the nanometer scale, and that the student understands the underlying processes of the different analytical methods.

Knowledge and understanding

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

- give an account of elastic and inelastic dispersion of electrons in solid materials
- in detail describe the principles behind imaging with microskopic methods
- give an account of electron and light induced phenomena on surfaces and what these lead to in the form of emission and reflection.

Competence and skills

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

- predict properties such as X-ray emission Auger electron emission and secondary electron emission based on a knowledge of electron structure
- apply their knowledge to choose an appropriate analytical method for a certain materials problem
- analyse images and spectra from various types of materials, both qualitatively and quantitatively.

Judgement and approach

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

- evaluate the accuracy and precision of different analytical methods
- explain possible artifacts and sources of error.

Course content

- Elastic and inelastic dispersion
- Electromagnetic lenses
- Principles and function of various types of electron and scanning probe microscopes
- Spectrometers for elemental analysis: Energy dispersive X-ray spectrometer (XEDS), electron energy loss spectrometer (EELS)
- Identification and quantification of spectra
- Methods for surface analysis. Auger spectroscopy. Scanning probe microscopy.

Course design

The teaching consists of lectures, laboratory sessions and exercises.

Assessment

Written exam at the end of the course. Written partial exam after about 4 weeks, that gives additional points for passed main 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.
Examination result together with points from the partial exam gives final grade. To pass the entire course, a passed examination is required. The final grade is decided through examination together with points from the partial exam. Students who do not pass a regular assessment will be offered another opportunity for assessement soon thereafter.

Entry requirements

For admission to the course, 90 credits natural sciences are required, in which is

included knowledge equivalent to FYSC01 Physics 3: Modern physics, 30 credits, as well as FYSD13 Process and komponentteknologi, 7.5 credits.

Further information

The course is coordinated with the LTH course KOO105 Materials Analysis at the Nanoscale, 7,5 credits, given by LTH, and can not be part of a degree together with this course.

Subcourses in FYSD21, Physics: Materials Analysis at the Nanoscale

Applies from V16

1501 Materials analysis at the nanoscale, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction