



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Analys på nanoskalan

Materials Analysis at the Nanoscale

KASF15, 7,5 credits, G2 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED B/K

Date of Decision: 2023-04-18

General Information

Main field: Technology.

Main field: Nanoscience.

Compulsory for: MNAV1, N3

Elective for: K4-m

Language of instruction: The course will be given in English

Aim

- The student should acquire an active base of knowledge on methods for morphological, structural and elemental analysis on a nanometer scale.
- The student should understand the mechanisms behind the different analysis methods.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to use acquired knowledge of electronic structure to predict properties like x-ray emission, Auger electron emission or secondary electron emission
- understand the principle of elastic and inelastic electron scattering in solid materials
- understand the principles of imaging with microscopy methods
- understand electron- and light induced phenomena on surfaces and the subsequent emission or reflection

Competences and skills

For a passing grade the student must

- be able to apply their knowledge to choose a suitable method of analysis for a particular problem
- be able to analyse images and spectra from different materials, both qualitatively and quantitatively

Judgement and approach

For a passing grade the student must

- be able to evaluate accuracy and precision for different methods of analysis
- explain possible artefacts and sources of error.

Contents

- Overview of solid state micro analysis methods.
- The electron microscope as an analytical tool.
- Identification of phases by morphology, chemical composition, electron diffraction and high resolution transmission electron microscopy.
- Scanning electron microscopy.
- XEDS and EELS for elemental analysis.
- Methods for surface analysis: Atomic force microscopy, Scanning tunnelling microscopy, LEED, X-ray photoelectron spectroscopy (XPS)

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Written final examination. Written midterm examination after approx. 4 weeks which can count for bonus points on the final grade with a passed final examination.

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.

Admission

Admission requirements:

- KOOA15 General Chemistry or approved parts 0116 General and Inorganic Chemistry 6 credits and 0216 Laboratory Exercises 0 credits of the course KOKA30 General, Inorganic and Organic Chemistry

The number of participants is limited to: No

The course overlaps following course/s: KOO105

Reading list

- DB Williams and BC Carter: Transmission Electron Microscopy. Springer, 2009, ISBN: 978-0-387-76501-3 (e-book), 9780387765020 (print). The e-book is available

for free download from Springer.com within the LU network. The print book is identical and also acceptable as literature for the course.

- G Attard and C Barnes: Surfaces. Oxford University Press, 1998, ISBN: 0-19-855686-1.

Contact and other information

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