FKD3390 Physical Methods in Surface and Material Characterisation 3.0 credits

Fysikaliska metoder i yt- och materialkarakterisering

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for FKD3390 valid from Autumn 2014

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

Qualification for Chemistry doctoral programme.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The course is designed to provide a general overview of what physical characterisation techniques are available in the field of materials (with a chemical view of “materials”), how they work, and which aspects of materials characterisation they address.

Course contents

The course will be run as an intensive 1 week course with 4-6 hours of lectures per day.

This course will provide a comprehensive overview of the most important and state of the art methods used in the characterization of materials. The techniques covered include physical and spectroscopic methods of characterization, highlighting approaches to their use to define important attributes of the atomic, compositional/chemical, and mesoscopic/physical/morphological features of materials. The lecture topics and methods of characterization that will be covered include:

(a) Introduction: What is a material? What is materials chemistry?

(b) Overview of protocols and probes used in materials characterization.

(c) Surface Analysis: X-ray Photoelectron Spectroscopy (XPS); Auger Electron Spectroscopy (AES).

(d) Ion Beam Methods: Secondary Ion Mass Spectroscopy (SIMS); Rutherford Back-scattering Spectroscopy (RBS).

(e) Introduction to Microscopy.

(f) Scanned Probe Methods: STM and AFM.

(g) Electron Microscopy: Scanning Electron Microscopy (SEM); Transmission Electron Microscopy (TEM); Scanning Transmission Electron Microscopy (STEM).

(h) Diffraction Methods: X-ray Diffraction (XRD); Electron Diffraction

(i) Optical and Spectroscopic Methods: X-ray Absorption Spectroscopy; Infrared Spectroscopy; Ellipsometry.

(j) Polymer Characterization.

In addition to homework assignments, a final project grade for the course will ask the students to write a report that outlines the use of an important method of materials characterization, one either taken from the course or of the students choosing, within a plan of research addressing an important frontier area interest in materials chemistry.

Course literature

Powerpoint material provided

Recommended reading

(a) Watts, John F. and Wostenholme, John; An Introduction to Surface Analysis by XPS and AES, 2003 (Wiley)

(b) Goodhew, Peter J., Humphreys, F. J. and Beanland, R.; Electron Microscopy and Analysis, 2001 (Taylor and Francis)

Examination

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Homework assignments.

Written reportthat outlines the use of an important method of materials characterization, one either taken from the course or of the students choosing, within a plan of research addressing an important frontier area interest in materials chemistry.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.