



# FKD3390 Fysikaliska metoder i yt- och materialkaraktisering 3,0 hp

Physical Methods in Surface and Material Characterisation

**Fastställande**

**Betygsskala**

G

**Utbildningsnivå**

Forskarnivå

**Särskild behörighet**

Qualification for Chemistry doctoral programme.

**Undervisningsspråk**

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

**Lärandemål**

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.

## Kursinnehåll

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.

## Kurslitteratur

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

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Homework assignments.

Written 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.

## Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.