

# Kursplan

för forskarkurs

**Elektronkristallografi**  
**Electron Crystallography**

**7.5 hp**  
**7.5 ECTS**

**Kurskod:** KZ41010  
**Gäller från:** VT2022

**Institution** Institutionen för material- och miljö kemi

## Förkunskapskrav och andra villkor för tillträde till programmet

Admitted to the graduate program.

Antagen till forskarutbildningen.

## Lärandemål

After completing the course, the student is expected to be able to:

From the theory (3.5 hp)

- understand the fundamentals of electron crystallography.
- understand the relationship between crystal structure, structure factors and symmetry.
- explain the relationship between diffraction data and space group and unit cell.
- understand how 3D electron diffraction (3D ED) can be used for structure solution and refinement.
- comprehend the use of high-resolution (scanning) transmission electron microscopy ((S)TEM) for structure determination.

From the lab practices and project (4 hp)

- get hands-on experience on how to perform acquisition of 3D electron diffraction data
- use electron diffraction data for determination of unit cell and symmetry.
- use 3D electron diffraction data for structure solution and refinement of a crystal structure.
- get practical experience to interpret and process high resolution (S)TEM images for the purpose of extracting crystallographic information, so called crystallographic image processing.
- plan and perform the structure determination of an unknown crystalline specimen.

## Innehåll

The course gives an overview of how to use different methods in the transmission electron microscopy in order to obtain crystallographic knowledge about a specimen. The course will cover the theoretical background in crystallography necessary to be able to analyse electron diffraction and (S)TEM images from a crystalline specimen. The course will introduce the concepts of how to obtain and use 3D electron diffraction data in order to perform structure solution and refinement of a crystal structure. The course will also cover how to retrieve crystallographic information from high-resolution (S)TEM images.

The course includes two parts:

- 1) Theory, 3.5 hp
- 2) Practical sessions and Project, 4 hp

### **Obligatoriska moment**

The course includes two compulsory individual assignments:

- 1) home-assignment covering the theory part,
- 2) project report; written and oral presentation

Participation in practical sessions and project work are compulsory.

### **Examinationsformer**

Part 1 (3.5 hp): Written exam

Part 2 (4 hp): Participation in the practical sessions, oral project presentation and written project report

### **Arbetsform**

The course contains two parts:

- (1) Theory: lectures covering the theoretical content of the course.
- (2) Practical sessions and Project:
  - (i) Practical sessions including exercises, data collection and hands-on computer labs for data treatment and structural analysis.
  - (ii) Project work includes sample preparation, literature search, data collection, data processing and structural analysis on both 3D ED and images, oral presentations and preparation of written report.