EPFL

MSE-435 | **Material science at large scale facilities**

Cursus	Sem.	Type
Materials Science and Engineering		Obl.
Materials Science and Engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Oral
Workload	120h
Weeks	14
Hours	**4 weekly**
Lecture	3 weekly
Exercises	1 weekly
Number of positions	

Remark

pas donné en 2023-24

Summary

This course gives a broad introduction into materials research using synchrotron X-rays and neutrons. After an introduction into the large scale facilities themselves we will dive into the different methods, including application examples from various fields of materials science.

Content

Content
- Interaction of X-rays/Neutrons with Matter
- About large scale facilities
    - synchrotron, XFEL, neutron sources
    - Beamlines & Detectors

- Scattering
    - Diffraction
    - Small-Angle Scattering
    - Magnetic Scattering
    - X-ray vs. Neutrons

- Spectroscopy
    - Fluorescence spectroscopy
    - X-ray Absorption Near-edge Structure
    - Extended X-ray Absorption Fine Structure
    - Photo emission spectroscopy

- Imaging and Tomography
    - X-ray absorption and phase contrast Imaging
    - Neutron Imaging
    - Coherent imaging
    - Scanning Imaging

The exercies will include the writing of a beamtime proposal for one specific material syste

Keywords

X-rays, Neutrons, Imaging, Spectroscopy, Scattering

Learning Prerequisites

Required courses

Basic understanding of materials science

Teaching methods

Lectures (3h) and Exercises (1h), excursion to PSI visiting the large scale facilities
The nature of the exercises will vary, depending on the topic at hand. For one selected material science application example the students should write a beamtime proposal according to the typical guidelines used at synchrotrons.

Assessment methods

One student project on beamtime proposal which will be presented within the last two weeks of the semester and one oral examination. The oral exam counts for 75% the student project 25%.

Resources

Moodle Link

- https://go.epfl.ch/MSE-435