MSE-450

Electron microscopy: advanced methods

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Cursus	Sem.	Type
Ing.-phys	MA2, MA4	Opt.
Materials Science and Engineering	MA2, MA4	Opt.
Physicien	MA2, MA4	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Oral
Workload	90h
Weeks	14
Hours	**3 weekly**
Lecture	2 weekly
Exercises	1 weekly
Number of positions	

Summary

With this course, the student will learn advanced methods in transmission electron microscopy, especially what is the electron optical setup involved in the acquisition, and how to interpret the data. After the course, students will be able to understand and assess TEM encountered in papers.

Content

1. Electron imaging and diffraction contrasts
2. Phase contrast
3. Scanning TEM
4. EDS-, EEL-spectroscopy in TEM.

Exercises and demonstrations concerning these themes.

Learning Prerequisites

Required courses

- Electron microscopy : introduction
- Basic knowledge of Solid state physics, Crystallography, Crystal defects

Learning Outcomes

By the end of the course, the student must be able to:

- Choose the appropriate TEM technique adapted to their problems
- Recognize The TEM techniques used in a publication
- Interpret TEM images
- Present the TEM results

Teaching methods

Seven weeks of the course will be with MOOCS, 7 weeks with conventional format, alternating over the semestre.
The weeks with MOOCS format, there will be time reserved at the microscope(s) to discuss and practice on the TEM the content of the lecture, as well as to answer student's questions.

Expected student activities

Follow the MOOCS *before* attending the TEM session for the 7 weeks on MOOCS format.

Assessment methods

Oral examination

Resources

Bibliography

Transmission Electron Microscopy
A Textbook for Materials Science
Williams, David B., **Carter**, C. Barry

Ressources en bibliothèque

- Electron energy loss spectroscopy / Egerton
- Transmission electron microscopy diffractometry of materials / Fultz
- Transmission electron microscopy : a textbook for materials science / Carter