

MSE-704

**3D Electron Microscopy and FIB-Nanotomography**

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Cursus	Sem.	Type
Materials Science and Engineering		Opt.

Language of teaching	English
Credits	1
Session	
Exam	Project report
Workload	30h
<b>Hours</b>	<b>14</b>
Lecture	8
Exercises	4
Practical work	2
<b>Number of positions</b>	

**Frequency**

Every year

**Summary**

The principles of 3D surface (SEM) reconstruction and its limitations will be explained. 3D volume reconstruction and tomography methods by electron microscopy (SEM/FIB and TEM) will be explained and compared with x-ray tomography.

**Content**

Physics of the different signals generated by electron beams and focused ion beams.

- Underlying physical principles for the acquisition of data sets for 3D reconstruction: interaction volumes, voxel (3 dimensional "pixel") size, mechanical stability issues for successful reconstruction.
- surface reconstruction (SEM), serial (parallel) sectioning (SEM/FIB and TEM), tilt series tomography (TEM)
- introduction to the use of software packages for 3D surface and volume reconstruction
- practical session about the 3D surface reconstruction by SEM
- practical session about 3D volume reconstruction by FIB nano-tomography
- practical session TEM tomography

**Keywords**

3D reconstruction, serial sectioning, electron tomography, FIB Nano-tomography, scanning electron microscopy, transmission electron microscopy

**Learning Prerequisites****Recommended courses**

background in electron microscopy: electron microscopy lecture 5 sem. Bachelor level or doctoral school SEM&TEM or equivalent

**Assessment methods**

Project Report

**Resources**

**Moodle Link**

- <https://go.epfl.ch/MSE-704>