

MSE-461

**Micro and nanostructuration of materials**

Muralt Paul

<b>Cursus</b>	<b>Sem.</b>	<b>Type</b>
Materials Science and Engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	2
Session	Summer
Semester	Spring
Exam	Oral
Workload	60h
Weeks	14
<b>Hours</b>	<b>2 weekly</b>
Courses	2 weekly
<b>Number of positions</b>	

**Summary**

This course gives an introduction to micro and nano structuration of materials, mainly of thin films. The mastering of patterning techniques is a core competence to establish technology for communication and informatics. The fast advancement in this field requires an almost annual update.

**Content**

1. Introduction
2. Photolithography down to 20 nm's
3. Electron beam lithography
4. Wet etching - anisotropic wet etching of silicon
5. Dry etching techniques
6. Nano imprint techniques
7. Approaches to self assembly

**Keywords**

Principles of photo lithography, limits of optical resolution, photo resists, cold plasmas for dry etching, electrochemical processes in wet etching, interaction of e-beams with matter, self assembled monolayers, nucleation phenomena,

**Learning Prerequisites****Required courses**

basics in physics and chemistry

**Recommended courses**

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**Learning Outcomes**

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

- Explain the main patterning techniques
- Discuss photoresists and patterning techniques
- Justify the choice of methods

**Transversal skills**

- Use a work methodology appropriate to the task.
- Assess one's own level of skill acquisition, and plan their on-going learning goals.

### Teaching methods

ex-cathedra with exercises and demonstrations

### Expected student activities

learn, read, and make exercises

### Assessment methods

Oral exam at the end

### Supervision

Office hours	Yes
Assistants	Yes

### Resources

#### Bibliography

### Notes/Handbook

Printed foils handed out and available as pdf

### Websites

- <http://my.epfl.ch>