# Clean room techniques in nanoscience

Lecture allocated to 2\textsuperscript{nd} semester in module Electives

<table>
<thead>
<tr>
<th>Module Code</th>
<th>LSF-QISPOS:</th>
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<tbody>
<tr>
<td>Credit Points</td>
<td>3</td>
</tr>
<tr>
<td>Weekly Classroom Hours per Semester</td>
<td>2</td>
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<tr>
<td>Language of Instruction and Examinations</td>
<td>english</td>
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<tr>
<td>Duration of Module</td>
<td>1 semester</td>
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<tr>
<td>Cycle</td>
<td>summer semester</td>
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<tr>
<td>Responsible for Lecture</td>
<td>Dr. Alfred Plettl</td>
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<tr>
<td>Lecturer</td>
<td>Dr. Alfred Plettl</td>
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<tr>
<td>Allocation of Module to Study Programmes</td>
<td>Master degree in Advanced Materials, in Physics Elective for students with major subject Biomaterials Elective for students with major subject Nanomaterials</td>
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<tr>
<td>Prerequisites</td>
<td>Successful participation of 1\textsuperscript{st} semesters compulsory courses</td>
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## Learning Outcomes

The course is related to the interdisciplinary topics of nanofabrication and their applications. That is to the generation and the arrangement of small objects (≤ 100 nm), usually on a smooth surface. For this purpose, clean rooms are used and several special conventional clean room and lithography techniques are combined with so-called unconventional lithography methods. In summer semester emphasis is more on the conventional fabrication principles.

The students will learn the basics of a clean room, the fundamental concepts of sample cleaning and handling, and of various lab-typical conventional lithography methods. They will become familiar with different deposition and etching techniques - both optimized for the nanoscale - , and in short, some appropriate metrology methods.

## Course Contents

- Clean room (concepts, materials, clothing, rules, security)
- Typical samples, cleaning strategies, storage and handling
- Optical lithography (mask aligners, laser-beam mask writing)
- Electron-beam lithography (physics, lab-standard, high-resolution, low-voltage, ebeam-assisted deposition)
- Deposition of metals and oxides (evaporation, PLD, ALD)
- Wet and dry etching (HF, plasma (deep-Si, deposition, nanoscale-RIE))
- Ion-beam techniques (FIB, sputtering, lithography)
- Metrology (HRSEM, TEM, AFM, optical microscopy, stylus profiler)
- Applications (nanoimprint lithography, microfluidics)

## Literature


Handouts

## Assessment of Work Load

28 h lecture (presence)
46 h preparation and revision lecture
16 h exam preparation

Total: 90 h

## Examinations

Written examination

## Grading

Result of the written exam with the weight of the whole module

## Usability

MS\textsuperscript{c} course of studies Advanced Materials
Some Electives (e.g. Unconventional Lithography)