Concepts of Spectroscopy 2 (iMOS)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
<th>Workload</th>
<th>Term</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>9 CP</td>
<td>270 h</td>
<td>2. Semester</td>
<td>Each SuS</td>
<td>1 Semester</td>
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Courses
- a) Lectures
- b) Exercises
- c) Integrated laboratory practical

Contact hours
- a) 2 SWS
- b) 1 SWS
- c) 5 SWS

Self-Study
- 120 h

Group size
- a+b) 20 - 50
- c) 5-20 Students

Prerequisites
- a, b, c) Advanced knowledge in quantum chemistry, quantum mechanics and spectroscopic techniques, such as provided by the modules Concepts of Spectroscopy 1 and Dynamics and Simulation.
- c) Admission to M.Sc. iMOS

Learning outcomes
After successful completion of the module/course, students will be able to:
- Obtain theoretical and practical knowledge of nonlinear optics important for non-linear spectroscopic and microscopic techniques to investigate structure, dynamics and interactions of chemical and biochemical samples
- Understand practical laser spectroscopic techniques in the lab course and their application in ongoing research projects through a hands-on approach
- Write reports with theories, experiments, and discussion of results
- Develop presentation skills in front of an audience
- Utilize digital techniques to prepare and conduct a presentation

Content
- Principles of non-linearity: Electromagnetic waves in vacuum and in matter, Non-linear responses, Anharmonic oscillator model, Phase matching, Higher order processes
- Non-linear spectroscopy techniques: SFG, SHG, Time-resolved spectroscopy

Teaching methods
- a+b) Active participation during lectures and exercises with problems for self-studying, Q&A and discussion sessions with presentations given by the participants, Moodle course with online material.
- c) Hands-on laboratory projects to be done in supervised sessions

Mode of assessment
- a + b) 20 - 40 min end-of-term oral exam or 2-hour end-of-term written exam on the content of the lectures
- c) graded lab reports handed in during the term on the integrated practical

Requirement for the award of credit points
- a+b) Passing the written examination
- c) successful acceptance of lab reports

Module applicability
- a+b+c) M.Sc. iMOS; a+b) M.Sc. Chemistry, M.Sc. Lasers and Photonics

Weight of the mark for the final score
Weighted according to CPs
- iMOS: CP-weighted average of the exam (5 CP) and the lab report (4 CP) grades according to the
examination regulations

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<th>Module coordinator and lecturer(s)</th>
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<tr>
<td>P. Petersen</td>
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<td>Lecturers from Physical Chemistry departments</td>
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Further information