<table>
<thead>
<tr>
<th>Code No.</th>
<th>Workload</th>
<th>Credit points</th>
<th>Available in semester</th>
<th>Frequency</th>
<th>Course duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 14</td>
<td>420 h</td>
<td>14 CP</td>
<td>3</td>
<td>each WiS</td>
<td>8 weeks full-time or equivalent</td>
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</tbody>
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1. **Teaching Methods**
   - Research oriented lab project in one of the international research groups

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>Contact time</th>
<th>Self-study</th>
</tr>
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<tbody>
<tr>
<td>Compact course</td>
<td>typically 300 h</td>
<td>120 h</td>
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2. **Learning objectives**
   - Students are competent in applying computational and/or experimental methods within the context of state-of-the-art research, and in using the results to understand the properties of (bio)molecular systems. They can critically assess the scope and limitations of various approaches/approximations, visualize and present results.

3. **Soft skills: methodological, self, social competences**
   - Present research results graphically; understand and apply state-of-the-art experimental and/or computational methods, become familiar with alternative work-flow organization
   - Assess personal strengths and weaknesses, widen the personal horizon; act as a responsible ambassador for the home institute; deal with challenges and set-backs; enhance self-motivation skills
   - Work collaboratively within an international team, understand different perspectives; communicate effectively across cultures

4. **Prerequisite(s)**
   - Proof of at least 46 credit points obtained in courses attributed to the first and second semester

5. **Evaluation of the learning process**
   - Active participation in practical, feedback during and on the experiment, feedback on written lab report by teaching assistants

6. **Mode of examination**
   - Successful project completion and satisfactory written-up lab report

7. **Requirements for acquiring credit points**
   - Positive assessment of the lab report

8. **Significance for overall grade**
   - Weighted according to CPs

9. **Module contents**
   - The practical is carried out in a research group located at one of our international partner universities/scientific institutions. Students will learn methods complementary to those available at Ruhr University Bochum.
   - Students are expected to extend their experimental/theoretical skills to techniques not available in Bochum or to apply skills gained in Bochum to research topics in the hosting group.
   - A wide variety of topics are possible. Examples of completed projects:
     - AIMD simulations and theoretical assignment of coupled solute-solvent modes (Université d’Evry val d’Essonne)
     - Assignment of Tunneling motions in small water cluster (UC Berkeley)
     - Messenger spectroscopy of ionic liquids in the IR; gas phase IR spectroscopy (Yale University)
     - Simulation of Hv1 to investigate the opening mechanism of the proton channel (UC Irvine)
     - Single-point analysis on selected frames of a CPMD trajectory file; developing Ab-initio based potentials for ions using dipoles and force fitting procedure (ENS Paris)
Students will give an oral presentation of results on their return to RUB.

| 10 | **Person in charge / Supervisor(s)**  
|    | Prof. Dr. Havenith-Newen  
|    | Faculty of the partner universities of the international Master Molecular Sciences |