1. Module title: **Quantum Theory of Condensed Matter II: Mesoscopic Physics**

2. Field / responsibility of: Physics / the faculty, the Dean of Studies

3. Module contents:
   - Fundamental concepts and phenomena
   - Electric and magnetoelectric modes
   - Landauer-Büttiker formalism
   - S-matrix formalism and numerical techniques
   - Quantum Hall effects
   - Single electron tunneling
   - Localization and scaling theory of conductivity
   - Feynman diagrams for disordered systems

4. Qualification objectives of the module / competencies to be acquired:
   This lecture presents the theory of quantum transport in mesoscopic and low-dimensional electronic systems.

5. Prerequisites for participation:
   - a) Recommended knowledge: Quantum mechanics II, quantum theory of condensed matter I, the structure of matter II
   - b) Prerequisite courses: None

6. Module can be used for:
   - MSc. in Physics, MSc. in Nanoscience, MSc. in Comp. Science; BSc. in Nanoscience, BSc. in Computational Science

7. Module is offered: On a yearly basis

8. Module can be completed in: 1 semester

9. Recommended semester of study: Minimum: 1

10. Overall module workload / number of credit points:
    **Workload:**
    - Total number of hours: 240
    **Allocation:**
    - 1. Attendance: 6 credit hours
    - 2. Independent study (including exam preparation/exam): 150 hours
    - Credit points: 8

11. The module is successfully completed when the requirements below have been met.

12. Module components:

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Req./req. elective</th>
<th>Form of teaching</th>
<th>Subject area / topic</th>
<th>Credit hours</th>
<th>Coursework</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY-M-VF 1 3.1</td>
<td>Required elective</td>
<td>Lecture Practical course</td>
<td>Quantum theory of condensed matter II: Mesoscopic physics</td>
<td>6</td>
<td>Practical exercises</td>
</tr>
<tr>
<td>Nr.</td>
<td>Competence / topic</td>
<td>Type of exam</td>
<td>Duration</td>
<td>Time / notes</td>
<td>Weighting for module grade</td>
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<tr>
<td>PHY-M-VF 1 3.1</td>
<td>Quantum theory of condensed matter II: Mesoscopic physics</td>
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<td></td>
<td>Type of exam: Oral or written; duration: 20 min, or 105 min, 135 min or 210 min (if it consists of two parts); time: Lecture period to end of semester</td>
<td>1</td>
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</tbody>
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14. Notes:
Further information will be provided by the instructors at the beginning of the course.