<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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</thead>
<tbody>
<tr>
<td>Quantum Mechanics II</td>
<td>11-QM2-161-m01</td>
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<table>
<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
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<tbody>
<tr>
<td>Managing Director of the Institute of Theoretical Physics and Astrophysics</td>
<td>Faculty of Physics and Astronomy</td>
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<tr>
<th>ECTS</th>
<th>Method of grading</th>
<th>Only after succ. compl. of module(s)</th>
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<tbody>
<tr>
<td>8</td>
<td>numerical grade</td>
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<table>
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<tr>
<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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Contents

The contents of this lecture build upon and will be chosen in accordance with the topics of the Bachelor's degree course "Quantum Mechanics I". Topics might include:

for QM:
1. Historical introduction
2. Single-particle states in a central potential
3. Principles of quantum mechanics
4. Spin and angular momentum
5. Approximations of energy eigenvalues
6. Approximations for time-dependent problems
7. Second quantisation
8. Potential scattering
9. General scattering theory
10. Canonical formalism
11. Charged particles in electromagnetic fields
12. Quantum theory of radiation
13. Quantum entanglement

Intended learning outcomes

The students acquire in-depth knowledge of advanced quantum mechanics. This knowledge is highly relevant to most of the theoretical Master's degree courses in Astrophysics, Particle Physics and Condensed Matter Physics. The completion of this course is highly recommended.

Courses (type, number of weekly contact hours, language — if other than German)

V (4) + R (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 to 120 minutes) or oral examination of one candidate each (approx. 30 minutes) or oral examination in groups (groups of 2, approx. 30 minutes per candidate) or project report (approx. 8 to 10 pages) or presentation/talk (approx. 30 minutes).

If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.

Assessment offered: In the semester in which the course is offered and in the subsequent semester
Language of assessment: German and/or English

Allocation of places

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Additional information

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### Module description

**Referred to in LPO I (examination regulations for teaching-degree programmes)**

**Module appears in**

<table>
<thead>
<tr>
<th>Program</th>
<th>Year</th>
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<tbody>
<tr>
<td>Master's degree (1 major) Mathematics</td>
<td>2016</td>
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<tr>
<td>Master's degree (1 major) Physics</td>
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</tr>
<tr>
<td>Master's degree (1 major) Nanostructure Technology</td>
<td>2016</td>
</tr>
<tr>
<td>Master's degree (1 major) Mathematical Physics</td>
<td>2016</td>
</tr>
<tr>
<td>Master's degree (1 major) Computational Mathematics</td>
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</tr>
<tr>
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<tr>
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<tr>
<td>Master's degree (1 major) Mathematics</td>
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<tr>
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<tr>
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<tr>
<td>Master's degree (1 major) Quantum Technology</td>
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