Annex SFB

Studienfachbeschreibung (subject description, SFB) for the subject
Mathematics as a Master’s with 1 major
with the degree "Master of Science" (120 ECTS credits)

Responsible: Institute of Mathematics

Examination regulations version: 2016

Abbreviations used:

Course types: E = field trip, K = colloquium, O = conversatorium, P = placement/lab course, R = project, S = seminar, T = tutorial, Ü = exercise, V = lecture

Term: SS = summer semester, WS = winter semester

Methods of grading: NUM = numerical grade, B/NB = (not) successfully completed

Regulations: (L)ASPO = general academic and examination regulations (for teaching-degree programmes), FSB = subject-specific provisions, SFB = list of modules

Other: A = thesis, LV = course(s), PL = assessment(s), TN = participants, VL = prerequisite(s)

Conventions for the modules in this SFB:

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

Information on assessment procedures:

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should a module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.
In accordance with the general regulations governing the degree subject described in this module catalogue:

**ASPO2015**

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

**13-Jan-2016 (2016-2)**

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.

Every module will be described using the following form:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Module title</th>
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<tbody>
<tr>
<td>ECTS</td>
<td>Duration (in semesters)</td>
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<tr>
<td>Courses</td>
<td>To be specified in the form X (y) with course type X abbreviated as specified above and number of weekly contact hours y</td>
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<tr>
<td>Method of assessment</td>
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Only after successful completion of

Other prerequisites

Participants and allocation of places

Additional information

Referred to in LPO I (examination regulations for teaching-degree programmes)
| 10-M=AAAN-161-m01 | Applied Analysis |  |
|---|---|---|---|---|---|---|---|---|---|---|
| ECTS | 10 | Duration | 1 semester | Method of grading | numerical grade | Modul level | graduate | Courses | V (4) + Ü (2) |
|     |     |     |     |     |     |     |     | Module taught in: German and/or English |     |
| Method of assessment | a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) |
| Assessment offered: In the semester in which the course is offered and in the subsequent semester |
| Language of assessment: German or English |
| creditable for bonus |  |

| 10-M=AAL-G-161-m01 | Topics in Algebra |  |
|---|---|---|---|---|---|---|---|---|---|---|
| ECTS | 10 | Duration | 1 semester | Method of grading | numerical grade | Modul level | graduate | Courses | V (4) + Ü (2) |
|     |     |     |     |     |     |     |     | Module taught in: German and/or English |     |
| Method of assessment | a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) |
| Assessment offered: In the semester in which the course is offered and in the subsequent semester |
| Language of assessment: German or English |
| creditable for bonus |  |

| 10-M=ADG-M-161-m01 | Differential Geometry |  |
|---|---|---|---|---|---|---|---|---|---|---|
| ECTS | 10 | Duration | 1 semester | Method of grading | numerical grade | Modul level | graduate | Courses | V (4) + Ü (2) |
|     |     |     |     |     |     |     |     | Module taught in: German and/or English |     |
| Method of assessment | a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) |
| Assessment offered: In the semester in which the course is offered and in the subsequent semester |
| Language of assessment: German or English |
| creditable for bonus |  |

<p>| 10-M=AFT-H-161-m01 | Complex Analysis |  |
|---|---|---|---|---|---|---|---|---|---|---|
| ECTS | 10 | Duration | 1 semester | Method of grading | numerical grade | Modul level | graduate | Courses | V (4) + Ü (2) |
|     |     |     |     |     |     |     |     | Module taught in: German and/or English |     |
| Method of assessment | a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) |
| Assessment offered: In the semester in which the course is offered and in the subsequent semester |
| Language of assessment: German or English |
| creditable for bonus |  |</p>
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<th>Numerical Grade</th>
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### Giovanni Prodi Lecture (Master)

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**Courses**

V (3) + Ü (1)

Module taught in: English

**Method of assessment**

- a) written examination (approx. 60 to 90 minutes, usually chosen) or
- b) oral examination of one candidate each (approx. 15 minutes) or
- c) oral examination in groups (groups of 2, approx. 10 minutes per candidate)

Assessment offered: In the semester in which the course is offered and in the subsequent semester

Language of assessment: English
creditable for bonus

### Selected Topics in Analysis

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**Courses**

V (4) + Ü (2)

Module taught in: German and/or English

**Method of assessment**

- a) written examination (approx. 90 to 120 minutes, usually chosen) or
- b) oral examination of one candidate each (approx. 20 minutes) or
- c) oral examination in groups (groups of 2, 15 minutes per candidate)

Assessment offered: In the semester in which the course is offered and in the subsequent semester

Language of assessment: German or English
creditable for bonus

### Algebraic Topology

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**Courses**

V (4) + Ü (2)

Module taught in: German and/or English

**Method of assessment**

- a) written examination (approx. 90 to 120 minutes, usually chosen) or
- b) oral examination of one candidate each (approx. 20 minutes) or
- c) oral examination in groups (groups of 2, 15 minutes per candidate)

Assessment offered: In the semester in which the course is offered and in the subsequent semester

Language of assessment: German or English
creditable for bonus

### Selected Topics in Financial Mathematics

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**Courses**

V (4) + Ü (2)

Module taught in: German and/or English

**Method of assessment**

- a) written examination (approx. 90 to 120 minutes, usually chosen) or
- b) oral examination of one candidate each (approx. 20 minutes) or
- c) oral examination in groups (groups of 2, 15 minutes per candidate)

Assessment offered: In the semester in which the course is offered and in the subsequent semester

Language of assessment: German or English
creditable for bonus
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| **Complex Geometry** 10-M=VK-GE-161-m01                              | 10   | 1 semester | numerical grade   | graduate    | German and/or English |
| Courses                                                              |      |            | V (4) + Ü (2)     |             |                  |
| Method of assessment                                                 |      |            | a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) |
| Assessment offered: In the semester in which the course is offered and in the subsequent semester |      |            | Language of assessment: German or English | creditable for bonus |

| **Partial Differential Equations of Mathematical Physics** 10-M=VPD-P-161-m01 | 10   | 1 semester | numerical grade   | graduate    | German and/or English |
| Courses                                                              |      |            | V (4) + Ü (2)     |             |                  |
| Method of assessment                                                 |      |            | a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) |
| Assessment offered: In the semester in which the course is offered and in the subsequent semester |      |            | Language of assessment: German or English | creditable for bonus |

<p>| <strong>Pseudo Riemannian and Riemannian Geometry</strong> 10-M=V-PRG-161-m01       | 10   | 1 semester | numerical grade   | graduate    | German and/or English |
| Courses                                                              |      |            | V (4) + Ü (2)     |             |                  |
| Method of assessment                                                 |      |            | a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) |
| Assessment offered: In the semester in which the course is offered and in the subsequent semester |      |            | Language of assessment: German or English | creditable for bonus |</p>
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### Systems Biology

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**Method of assessment:**

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

**Language of assessment:**

German and/or English

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### Systems Biology F1

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**Method of assessment:**

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

**Language of assessment:**

German and/or English

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### Systems Biology F2

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**Method of assessment:**

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

**Language of assessment:**

German and/or English

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### Systems Biology B

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**Method of assessment:**

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

**Language of assessment:**

German and/or English
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**Courses**: S (2) + Ü (2)

**Method of assessment**
- a) written examination (approx. 90 to 180 minutes)
- b) oral examination of one candidate each (20 to 30 minutes)
- c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate)
- d) log (approx. 20 pages)
- e) presentation (approx. 30 minutes)

Language of assessment: German and/or English

### Theoretical Chemistry - Project course quantum chemistry

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**Courses**: P (5)

**Method of assessment**
- presentation (approx. 30 minutes)

Language of assessment: German and/or English

### Theoretical Chemistry - Project course quantum dynamics

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**Courses**: P (5)

**Method of assessment**
- presentation (approx. 30 minutes)

Language of assessment: German and/or English

### Application Subject Computer Science and Aerospace Computer Science

### Seminar 1 - Current Topics in Computer Science

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**Courses**: S (2)

**Method of assessment**
- term paper (10 to 15 pages) and presentation (30 to 45 minutes) with subsequent discussion on a topic from the field of computer science

Language of assessment: German and/or English

**Additional Information**
- Focuses available for students of the Master’s programme Informatik (Computer Science, 120 ECTS credits): AT, SE, IT, IS, ES, LR, HCI.

### Advanced Programming

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**Courses**: V (2) + Ü (2)

**Method of assessment**
- written examination (approx. 60 to 120 minutes)
  - If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
  - Language of assessment: German and/or English
  - Creditable for bonus
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### Mathematical Logic

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<td>5</td>
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**Courses**

- V (2) + Ü (2)

**Method of assessment**

- written examination (approx. 60 to 120 minutes).
- If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
- Language of assessment: German and/or English
- Creditable for bonus

### Medical Informatics

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<td>graduate</td>
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**Courses**

- V (2) + Ü (2)

**Method of assessment**

- written examination (approx. 60 to 120 minutes).
- If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
- Language of assessment: German and/or English
- Creditable for bonus

### Performance Engineering & Benchmarking of Computer Systems

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<td>numerical grade</td>
<td>graduate</td>
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**Courses**

- V (2) + Ü (2)

**Method of assessment**

- written examination (approx. 60 to 120 minutes).
- If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
- Language of assessment: German and/or English
- Creditable for bonus

### Computer Arithmetic

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<td>5</td>
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**Courses**

- V (2) + Ü (2)

**Method of assessment**

- written examination (approx. 60 to 120 minutes).
- If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
- Language of assessment: German and/or English
- Creditable for bonus
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<th>Method of Grading</th>
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Language of assessment: German and/or English

Creditable for bonus
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<td>Method of assessment</td>
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<td>Method of assessment</td>
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### Spintronics

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**Courses**

V (3) + R (1)
Module taught in: German or English

**Method of assessment**

- 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).

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**Assessment offered:** In the semester in which the course is offered and in the subsequent semester

**Language of assessment:** German and/or English

### Solid State Physics 2

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**Courses**

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

**Method of assessment**

- 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).

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**Assessment offered:** In the semester in which the course is offered and in the subsequent semester

**Language of assessment:** German and/or English

### Solid State Spectroscopy

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**Courses**

V (3) + R (1)
Module taught in: German or English

**Method of assessment**

- 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).

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**Assessment offered:** In the semester in which the course is offered and in the subsequent semester

**Language of assessment:** German and/or English
### Magnetism

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**Courses**

V (3) + R (1)

Module taught in: German or English

**Method of assessment**

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).

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Assessment offered: In the semester in which the course is offered and in the subsequent semester

Language of assessment: German and/or English

### Semiconductor Physics

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**Courses**

V (3) + R (1)

Module taught in: German or English

**Method of assessment**

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).

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Assessment offered: In the semester in which the course is offered and in the subsequent semester

Language of assessment: German and/or English

### Optical Properties of Semiconductor Nanostructures

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<td>numerical grade</td>
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**Courses**

V (3) + R (1)

Module taught in: German or English

**Method of assessment**

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).

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Assessment offered: In the semester in which the course is offered and in the subsequent semester

Language of assessment: German and/or English
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<td>Method of assessment</td>
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| 11-ASM-161-m01 | **Methods of Observational Astronomy** | 6    | 1 semester | numerical grade   | graduate    |
| Courses    | V (3) + R (1)                       |      |           |                   |             |
| Module taught in: | German or English               |      |           |                   |             |
| Method of assessment | 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          |      |           |                   |             |

<p>| 11-TPE-161-m01 | <strong>Experimental Particle Physics</strong> | 6    | 1 semester | numerical grade   | graduate    |
| Courses    | V (3) + R (1)                       |      |           |                   |             |
| Module taught in: | German or English               |      |           |                   |             |
| Method of assessment | 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          |      |           |                   |             |</p>
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### Quantum Information and Quantum Computing

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**Courses**
- V (3) + R (1) modules taught in: German or English

**Method of assessment**
- 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).

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Assessment offered: In the semester in which the course is offered and in the subsequent semester.

Language of assessment: German and/or English

### Theoretical Solid State Physics

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**Courses**
- V (4) + R (2) modules taught in: German or English

**Method of assessment**
- 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).

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Assessment offered: In the semester in which the course is offered and in the subsequent semester.

Language of assessment: German and/or English

### Theoretical Solid State Physics 2

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**Courses**
- V (4) + R (2) modules taught in: German or English

**Method of assessment**
- 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).

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Assessment offered: In the semester in which the course is offered and in the subsequent semester.

Language of assessment: German and/or English
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| 11-TOPO-161-m01 | **Topological Order**             | 6    | 1 semester | numerical grade   | graduate    | German and/or English  |
| Courses     | V (3) + R (1)                                  |      |           |                   |             |                        |
| Method of assessment | 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 |

| 11-TFP-161-m01 | **Topology in Solid State Physics**     | 6    | 1 semester | numerical grade   | graduate    | German and/or English  |
| Courses     | V (3) + R (1)                                  |      |           |                   |             |                        |
| Method of assessment | 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
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<td>ECTS 6 Duration 1 semester Method of grading numerical grade Modul level graduate Courses V (3) + R (1) Module taught in: German or English Method of assessment 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</td>
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| 11-BWW-161-m01   | Bosonisation and Interactions in One Dimension   | 6     | 1 semester | numerical grade | graduate    | German and/or English  |
|                  | Courses                                          | V (3) + R (1) |           | Module taught in: German or English |           |                        |
|                  | Method of assessment                             | 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 |           |                        |

<p>| 11-EIT-161-m01   | Gauge Theories                                   | 6     | 1 semester | numerical grade | graduate    | German and/or English  |
|                  | Courses                                          | V (3) + R (1) |           | Module taught in: German or English |           |                        |
|                  | Method of assessment                             | 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 |           |                        |</p>
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<td>Courses: V (3) + R (1) Module taught in: German or English</td>
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### Internship

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<th>other prerequisites</th>
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<td>10</td>
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<td>P (o)</td>
<td>a) report on practical course (15 to 30 pages) or b) talk (30 to 60 minutes)</td>
<td>In advance, please consult with a lecturer who agrees to be your supervisor.</td>
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### Thesis (30 ECTS credits)

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<td>30</td>
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<td>numerical grade</td>
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<td>No courses assigned to module</td>
<td>Master’s thesis (750 to 900 hours total) Registration and assignment of topic in consultation with supervisor. Language of assessment: German or English</td>
<td>The supervisor may make the successful completion of certain modules that are relevant for the respective topic a prerequisite for the assignment of the topic.</td>
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