

# Module Guide

## 28-M-TP3 Theoretical Physics

### 3

Fakultät für Physik

*Version dated Dec 13, 2025*

This module guide reflects the current state and is subject to change. Up-to-date information and the latest version of this document can be found online via the page

<https://ekvv.uni-bielefeld.de/sinfo/publ/modul/472483830>

The current and valid provisions in the module guide are binding and further specify the subject-related regulations (German "FsB") published in the Official Announcements of Bielefeld University.

## 28-M-TP3 Theoretical Physics 3

---

### Faculty

---

Fakultät für Physik

### Person responsible for module

---

Herr Prof. Dr. Gernot Akemann

### Regular cycle (beginning)

---

Every semester

### Credit points

---

10 Credit points

### Competencies

---

*Non-official translation of the module descriptions. Only the German version is legally binding.*

Students deepen their fundamental technical knowledge and skills in selected disciplines of theoretical physics. In addition to a broad overview of internal physical contexts, they have gained in-depth insights into the content and methods of theoretical and mathematical physics. You will be able to specialise in the field of theoretical or mathematical physics for a master's thesis.

### Content of teaching

---

The specific content is determined by the selected events. These can be, for example:

General theory of relativity  
Lattice field theory  
Hydrodynamics  
Non-equilibrium physics  
Quantum Chromodynamics  
Quantum Mechanics II  
Quantum field theory  
Quantum field theory at finite temperature and density  
Supersymmetry  
Theoretical solid state physics  
Random matrix theory

### Recommended previous knowledge

---

—

### Necessary requirements

## Explanation regarding the elements of the module

The courses are offered either to the extent of 10 CP (type A or C) or twice 5 CP (type B). The scope and any other suitable courses will be announced in the electronic course catalogue (ekvv). Either one lecture with tutorial (A) or two lectures with tutorials (B.1 + B.2) or one lecture with tutorial and accompanying seminar (C) must be studied.

As a rule, a course of type A is attended due to the range of courses offered, type C or B.1+B.2 are an exception. As a rule, this module is completed with one examination.

Module structure: 1-2 SL, 1-2 bPr <sup>1</sup>

## Courses

| Title                                   | Type     | Regular cycle | Workload <sup>5</sup> | LP <sup>2</sup> |
|---|----------|---------------|-----------------------|-----------------|
| Seminar on Theoretical Physics 3 (C)    | seminar  | WiSe&SoSe     | 90 h (30 + 60)        | 3 [SL]          |
| Theoretical Physics 3 (A)               | lecture  | WiSe&SoSe     | 150 h (60 + 90)       | 5 [Pr]          |
| Theoretical Physics 3 (B.1)             | lecture  | WiSe&SoSe     | 90 h (30 + 60)        | 3 [Pr]          |
| Theoretical Physics 3 (B.2)             | lecture  | WiSe&SoSe     | 90 h (30 + 60)        | 3 [Pr]          |
| Theoretical Physics 3 (C)               | lecture  | WiSe&SoSe     | 120 h (45 + 75)       | 4 [Pr]          |
| Tutorial on Theoretical Physics 3 (A)   | exercise | WiSe&SoSe     | 90 h (30 + 60)        | 3 [SL]          |
| Tutorial on Theoretical Physics 3 (B.1) | exercise | WiSe&SoSe     | 30 h (15 + 15)        | 1 [SL]          |
| Tutorial on Theoretical Physics 3 (B.2) | exercise | WiSe&SoSe     | 30 h (15 + 15)        | 1 [SL]          |
| Tutorial on Theoretical Physics 3 (C)   | exercise | WiSe&SoSe     | 30 h (15 + 15)        | 1 [SL]          |

## Study requirements

|                    |          |                 |
|--------------------|----------|-----------------|
| Allocated examiner | Workload | LP <sup>2</sup> |
|--------------------|----------|-----------------|

|   |           |           |
|---|-----------|-----------|
| <p>Teaching staff of the course <b>Seminar on Theoretical Physics 3 (C) (seminar)</b></p> <p><i>The seminar is linked to a study coursework in the form of an own presentation and active participation in the scientific discourse (asking questions) as well as the follow-up of the other presentations.</i></p>   | see above | see above |
| <p>Teaching staff of the course <b>Tutorial on Theoretical Physics 3 (A) (exercise)</b></p> <p><i>Regular completion of the exercises (usually 50%), in each case with a recognisable and goal-oriented solution approach, as well as participation in the exercise groups (in particular: Presentation of own solutions or solution approaches, asking technical questions and critical discussion of the physical problems, working on attendance exercises).</i></p> <p><i>The exercises to be worked on will be issued one week in advance. The lecturer determines the exact criteria at the beginning of the course and announces them.</i></p>   | see above | see above |
| <p>Teaching staff of the course <b>Tutorial on Theoretical Physics 3 (B.1) (exercise)</b></p> <p><i>Regular completion of the exercises (usually 50%), in each case with a recognisable and goal-oriented solution approach, as well as participation in the exercise groups (in particular: Presentation of own solutions or solution approaches, asking technical questions and critical discussion of the physical problems, working on attendance exercises).</i></p> <p><i>The exercises to be worked on will be issued one week in advance. The lecturer determines the exact criteria at the beginning of the course and announces them.</i></p> | see above | see above |
| <p>Teaching staff of the course <b>Tutorial on Theoretical Physics 3 (B.2) (exercise)</b></p> <p><i>Regular completion of the exercises (usually 50%), in each case with a recognisable and goal-oriented solution approach, as well as participation in the exercise groups (in particular: Presentation of own solutions or solution approaches, asking technical questions and critical discussion of the physical problems, working on attendance exercises).</i></p> <p><i>The exercises to be worked on will be issued one week in advance. The lecturer determines the exact criteria at the beginning of the course and announces them.</i></p> | see above | see above |
| <p>Teaching staff of the course <b>Tutorial on Theoretical Physics 3 (C) (exercise)</b></p> <p><i>Regular completion of the exercises (usually 50%), in each case with a recognisable and goal-oriented solution approach, as well as participation in the exercise groups (in particular: Presentation of own solutions or solution approaches, asking technical questions and critical discussion of the physical problems, working on attendance exercises).</i></p> <p><i>The exercises to be worked on will be issued one week in advance. The lecturer determines the exact criteria at the beginning of the course and announces them.</i></p>   | see above | see above |

| Allocated examiner   | Type                         | Weighting | Workload | LP <sup>2</sup> |
|--|------------------------------|-----------|----------|-----------------|
| Teaching staff of the course <b>Theoretical Physics 3 (A) (lecture)</b><br><i>Written exam (approx. 2-3 hours)</i><br><i>Oral examination (approx. 30 minutes)</i><br><i>The module examination covers the lecture and tutorial.</i>   | Klausur o. mündliche Prüfung | 1         | 60h      | 2               |
| Teaching staff of the course <b>Theoretical Physics 3 (B.1) (lecture)</b><br><i>Written exam (approx. 2-3 hours)</i><br><i>Oral examination (approx. 30 minutes)</i><br><i>The module examination covers the lecture and tutorial.</i> | Klausur o. mündliche Prüfung | 1         | 30h      | 1               |
| Teaching staff of the course <b>Theoretical Physics 3 (B.2) (lecture)</b><br><i>Written exam (approx. 2-3 hours)</i><br><i>Oral examination (approx. 30 minutes)</i><br><i>The module examination covers the lecture and tutorial.</i> | Klausur o. mündliche Prüfung | 1         | 30h      | 1               |
| Teaching staff of the course <b>Theoretical Physics 3 (C) (lecture)</b><br><i>Written exam (approx. 2-3 hours)</i><br><i>Oral examination (approx. 30 minutes)</i><br><i>The module examination covers the lecture and tutorial.</i>   | Klausur o. mündliche Prüfung | 1         | 60h      | 2               |

## Legend

---

- 1 The module structure displays the required number of study requirements and examinations.
  - 2 LP is the short form for credit points.
  - 3 The figures in this column are the specialist semesters in which it is recommended to start the module. Depending on the individual study schedule, entirely different courses of study are possible and advisable.
  - 4 Explanations on mandatory option: "Obligation" means: This module is mandatory for the course of the studies; "Optional obligation" means: This module belongs to a number of modules available for selection under certain circumstances. This is more precisely regulated by the "Subject-related regulations" (see navigation).
  - 5 Workload (contact time + self-study)
- SoSe** Summer semester
- WiSe** Winter semester
- SL** study requirement
- Pr** Examination
- bPr** Number of examinations with grades
- uPr** Number of examinations without grades