<table>
<tr><td colspan="6">Secondary Area of Specialization: Solid State Theory / Computational Physics</td></tr>
<tr><td>Identification number

MN-P-PN-ThSol</td><td>Workload

360 h</td><td>Credits

12 CP</td><td>Term of studying

1st and 2nd semester</td><td>Frequency of occurrence

Details are provided online in the table “Course Offerings”.</td><td>Duration

2 semesters</td></tr>
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1	Type of lessons	Contact times	Self-study times	Intended group size
	a) Lecture	depending on the	depending on the	
	b) Problem class	individual choice	individual choice	15–20 students per problem class
	c) Exam	1 h	24 h	

2 Aims of the module and acquired skills

Comprehension of the fundamental concepts used to theoretically describe solids and their excitations / ability to describe phenomena like superconductivity and magnetism / computational approach to problem solving with applications to many-body physics

3 Contents of the module

The module is subdivided into core courses, specialized courses and the advanced seminar

1. Core Courses

- Solid State Theory (3+1 HPW, 6 CP): Concepts of solid state theory and description of excitations in solid
- Computational Many-Body Physics (3+1 HPW, 6 CP): Overview of elementary numerical approaches to study many-body systems, both classical and quantum.
- Quantum Field Theory I (4+2 HPW, 9 CP): Modern methods to describe solids based on functional integrals and by using diagrammatic methods

2. Specialized courses:

- Quantum Field Theory II (4+2 HPW, 9 CP)
- One course chosen from the specialized courses of the module Condensed Matter Physics
- Advanced Topics in Solid State Theory (3+1 HPW, 6 CP)
- Hydrodynamics (2+2 HPW, 6 CP)
- and others, including fitting courses from Bonn University, if approved by the module coordinator

3. Advanced Seminar on topical subjects of Solid State Theory (2 HPW, 3 CP)

The contents of the specialized courses can be found in the “kommentiertes Vorlesungsverzeichnis” and in the lecture descriptions online.

4 Teaching/Learning methods

Besides the teaching in lectures, the self-study based on books and lecture notes plays an important role. The students work individually on problem sets and implement computational algorithms. In discussions with others and in the problem classes, they learn to solve challenging problems in a team and to present their approaches and results.

5 Requirements for participation

Basic knowledge in theoretical physics at the level of the bachelor courses in physics

6	Type of module examinations The module is passed by passing an oral examination covering the topics of all attended courses. To be admitted to the exam, students must actively participate in the problem sessions (including the solution of homework problems). The grade given for the module is equal to the grade of the oral examination.
7	Requisites for the allocation of credits The following courses have to be chosen from the list given above in order to acquire the necessary credit points: 1. one of the core courses 2. further core courses, specialized courses or an advanced seminar The module is passed by passing an oral examination covering the topics of all attended courses.
8	Compatibility with other Curricula and Soft Skills As elective subject in other M.Sc. programs. Analysis of complex problems, scientific reading and presentation skills, in particular oral presentations.
9	Significance of the module mark for the overall grade The weight of the module is 12/111 ≈ 10.8 %.
10	Module coordinator A. Rosch
11	Additional information Detailed information on the occurrence and the course contents are provided online and in the "kommentiertes Vorlesungsverzeichnis". Version: 05.06.2015 HK