

Primary Area of Specialization: Condensed Matter Physics

Identification number	Workload	Credits	Term of studying	Frequency of occurrence	Duration
MN-P-SP-CondMat	(540 + 90) h	21 CP	1 st to 3 rd semester	Details are provided online in the table "Course Offerings".	3 semesters
1	Type of lessons a) Lecture b) Problem class c) Advanced Seminar d) Exam	Contact times depending on the individual choice 10 h 1 h	Self-study times depending on the individual choice 80 h 24 h	Intended group size 15–20 Students per problem class individual counseling for the seminar	
2	<p>Aims of the module and acquired skills</p> <p>Students shall deepen their understanding and knowledge of the main concepts (experimental & theoretical) of condensed matter physics and get familiar with some important experimental methods in condensed matter physics. In specialized courses selected up-to-date research topics of experimental condensed matter physics are discussed as applications of the main concepts and as a preparation for the master thesis. In advanced seminars, students shall acquire a comprehensive understanding of a particular topic and improve their presentation skills.</p>				
3	<p>Contents of the module</p> <p>The module is subdivided into core courses and specialized courses:</p> <p>1. Core course</p> <ul style="list-style-type: none"> • Condensed Matter Physics I (3+1 HPW, 6 CP): Crystal structure and binding, Reciprocal space, Lattice dynamics and thermal properties, Free electron gas • Condensed Matter Physics II (3+1 HPW, 6 CP): Band structure, Metals and semiconductors, Transport properties, Dielectric function and screening, Superconductivity, Magnetism <p>2. Specialized courses</p> <ul style="list-style-type: none"> • Experimental Methods of Condensed Matter Physics (2 HPW, 3 CP) • Superconductivity and Nanoscience (2 HPW, 3 CP) • Magnetism (2 HPW, 3 CP) • Semiconductor Physics (2 HPW, 3 CP) • Photons and Matter (2 HPW, 3 CP) • Physics of Surfaces and Nanostructures (2 HPW, 3 CP) • Introduction to Neutron Scattering (2 HPW, 3 CP) • Optical Spectroscopy (2 HPW, 3 CP) • Fundamentals of Spintronics (2 HPW, 3 CP) • and others, including fitting courses from Bonn University, if approved by the module coordinator <p>3. Advanced seminar in condensed matter physics (2 HPW, 3 CP)</p> <p>The contents of the specialized courses and of the advanced seminars can be found in the "kommentiertes Vorlesungsverzeichnis" and in the lecture descriptions online.</p>				

4	<p>Teaching/Learning methods</p> <p>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. 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. By preparing an advanced seminar, they become acquainted with a current topic of research, scientific methods and literature. They also learn to communicate in a pedagogical way on an advanced topic.</p>
5	<p>Requirements for participation</p> <p>Experimental and theoretical physics at the level of the bachelor courses in physics</p>
6	<p>Type of module examinations</p> <p>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) and present a scientific talk in the advanced seminar course. The grade given for the module is equal to the grade of the oral examination.</p>
7	<p>Requisites for the allocation of credits</p> <p>The Primary AoS Condensed Matter Physics is composed of:</p> <ol style="list-style-type: none"> 1. Two core courses Condensed Matter Physics I and II (2 x (3+1) HPW) 2. Two specialized courses in Condensed Matter Physics. At least one of the two has to be a course in experimental condensed matter physics, the second one can also be a course in theoretical condensed matter physics. 3. One advanced seminar in Condensed Matter Physics
8	<p>Compatibility with other Curricula and Soft Skills</p> <p>As elective subject in other M.Sc. programs.</p> <p>Scientific reading and presentation skills, in particular oral presentations. Computer aided analysis of scientific data.</p> <p>This module prepares for topics of current research in condensed matter physics and provides the basis for the preparation of the master thesis.</p>
9	<p>Significance of the module mark for the overall grade</p> <p>The weight of the module is $21/111 \approx 18.9\%$.</p>
10	<p>Module coordinator</p> <p>J. Hemberger</p>
11	<p>Additional information</p> <p>Detailed information on the occurrence and the course contents are provided online and in the "kommentiertes Vorlesungsverzeichnis".</p> <p>Version: 05.06.2015 HK</p>