

PHY-M-VF 12

Effective WS 2011/12

1. Module title:	Quantum Theory of Condensed Matter I: Fundamentals, Methods and Phenomena
2. Field / responsibility of:	Physics / the faculty, the Dean of Studies
3. Module contents:	<p>a. Fundamentals</p> <ul style="list-style-type: none">• Introduction and overview• Periodic structures, Bloch's theorem, band structure• Elementary excitations: Phonons• Drude-Boltzmann theory <p>b. Formalism of the second quantization</p> <ul style="list-style-type: none">• Interacting electron gas• Mean-field theory and Hartree-Fock approximation• Green's functions• Linear response theory <p>c. Phenomena (optional topics)</p> <ul style="list-style-type: none">• Electron-phonon interaction and superconductivity• Ferromagnetism• Transition metals and metal-insulator transition
4. Qualification objectives of the module / competencies to be acquired:	This lecture introduces basic terminology and methods of a many-body representation of fundamental phenomena in solid-state physics.
5. Prerequisites for participation:	
a) Recommended knowledge:	Quantum mechanics I and II
b) Prerequisite courses:	None
6. Module can be used for:	MSc. in Physics, MSc. in Nanoscience, MSc. in Comp. Science; BSc. in Nanoscience, BSc. in Computational Science
7. Module is offered:	On a yearly basis
8. Module can be completed in:	1 semester
9. Recommended semester of study:	Minimum: 1
10. Overall module workload / number of credit points:	Workload: Total number of hours: 240 Allocation: 1. Attendance: 6 credit hours 2. Independent study (including exam preparation/ exam): 150 hours Credit points: 8
11. The module is successfully completed when the requirements below have been met.	

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12. Module components:					
Nr.	Req./req. elective	Form of teaching	Subject area / topic	Credit hours	Coursework
PHY-M-VF 1 2.1	Required elective	Lecture Practical course	Quantum theory of condensed matter I: Fundamentals, methods and phenomena	6	Practical exercises
13. Module exam:					
Nr.	Competence / topic	Type of exam	Duration	Time / notes	Weighting for module grade
PHY-M-VF 1 2.1	Quantum theory of condensed matter I: Fundamentals, methods and phenomena			Type of exam: Oral or written; duration: 20 min, or 105 min, 135 min or 210 min (if it consists of two parts); time: Lecture period to end of semester	1
14. Notes:					
Further information will be provided by the instructors at the beginning of the course.					