



Module	<i>Ultracold Quantum Gases</i>
Code	71504
Instruction language	English
ECTS credits	6
Credit hours	5
Duration	1 semester
Cycle	Each summer semester
Coordinator	Prof. Johannes Hecker Denschlag
Lecturer	Prof. Johannes Hecker Denschlag
Allocation to study programmes	Physics M.Sc., elective module, 1 st or 2 nd semester Wirtschaftsphysik M.Sc., elective module, 1 st - 3 rd semester
Formal prerequisites	None
Recommended prerequisites	Fundamentals of Quantum Mechanics
Learning objectives	Students who have successfully completed this module <ul style="list-style-type: none">• have in-depth knowledge of quantum physics• know experimental methods for the investigation of gases at very low temperatures• understand the quantum-physical properties of extremely cold fermionic and bosonic gases
Syllabus	<ul style="list-style-type: none">• Laser cooling• Atomic and molecular traps• Ultra-cold collisions• Bose-Einstein condensation• Degenerate Fermi gases• Matter-wave interferometry• Superfluidity• Artificial solids with optical lattices• Non-linear dynamics with cold atoms• Quantum mechanical entanglement of atoms
Literature	
Teaching and learning methods	Lecture (3 hours per week) Exercise (2 hours per week)
Workload	45 hours lecture (attendance time) 30 hours exercise (attendance time) 105 hours self-study and exam preparation Total: 180 hours
Assessment	Written or oral examination. A prerequisite for the participation in the examination is an ungraded course achievement. Form and scope of the examination and of the course achievement are determined and notified



	by the lecturer at the beginning of the course.
Examination	12114 Ultracold Quantum Gases (precourse) 12104 Ultracold Quantum Gases
Grading procedure	The module grade is the examination grade.
Basis for	Research in the fields of Quantum Information and Technologies
