Module	***Atom Interferometry***
Code	
Instruction language	English
ECTS credits	6
Attendance time	5 hours per week
Duration	1 semester
Cycle	Each winter semester
Coordinator	Dean of Physics Studies
Instructors	Dr. Enno Giese
Allocation to study programmes	Physics M.Sc., elective module Wirtschaftsphysik M.Sc., elective module
Recommended prerequisites	Atomic Physics, Optics and Electrodynamics, Quantum Mechanics
Learning objectives	Students who successfully passed this module • are familiar with the concepts of matter-wave interferometry • able to transfer methods to other fields in quantum sensing and technology
Syllabus	• Matter-wave propagation in external fields • Matter-wave diffraction, optical lattices, and large-momentum transfer techniques • Neutron interferometry • Non-classical atomic sources • Gravimetry, gradiometry, and rotation sensing • Interferometry in taps and guiding potentials • Tests of fundamental physics and relativistic effects
Literature	• G. Grynberg, A. Aspect and C. Fabre, "Introduction to Quantum Optics: From the Semi-classical Approach to Quantized Light" (Cambridge University Press, 2010) • H. Rauch and S. A. Werner, "Neutron Interferometry: Lessons in Experimental Quantum Mechanics, Wave-particle Duality, and Entanglement" (Oxford University Press, 2015) • G. M. Tino and M .A. Kasevich (eds) "Atom Interferometry" (IOS Press, 2014) • M. Utsuro and V. K. Ignatovich, "Handbook of Neutron Optics" (WILEY-VCH, 2010) • M. Suda, "Quantum Interferometry in Phase Space: Theory and Applications" (Springer, 2006)
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	The module assessment consists of a graded written or oral exam. Participation in the examination requires an ungraded academic work. Examination form as well as form, content and scope of the academic work will be announced at the beginning of the lecture.
Examination	
Grading procedure	The module grade is equal to the examination grade.
Basis for	Research in the fields of quantum metrology, sensing, and technology