Module	***Computational Quantum Physics***
Code	71658
Instruction language	English
ECTS credits	6
Credit hours	5
Duration	1 semester
Cycle	Each winter semester
Coordinator	Dean of Physics Studies
Lecturer	Dr. Simone Montangero
Allocation to study programmes	Physics M.Sc., elective module, 1st or 2nd semester Wirtschaftsphysik M.Sc., elective module, 1st - 3nd semester
Formal prerequisites	None
Recommended prerequisites	Programming skills
Learning objectives	Students who successfully passed this module • are experienced in Python scripting and Fortran 90 programming • can solve many-body quantum system problems using numerical methods
Syllabus	• Computers and software for physicist • Programming good practices • Numerical solution to linear algebra problems • Numerical methods to solve the Schrödinger equation • Numerical Renormalization group methods • Tensor Networks methods • Elements of parallel processing
Literature	• W. Gibbs, Computation in Modern Physics, World Scientific (2006) • S. Oliveira, D. Stewart, Writing Scientific Software – A guide to good style, Cambridge University Press (2006). • P. De Forcrand, P. Werner, Computational Quantum Physics, ETH Lecture Notes (2009).
Teaching and learning methods	Lecture (3 hours per week) Exercise in PC-pool (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	12368 Computational Quantum Physics (precourse) 12367 Computational Quantum Physics
Grading procedure	The module grade is the mean value of the grades for the examination and the project work.
Basis for	Research in the field of Quantum Information and Technologies