Module title	**MScNano NQ2 Advanced Nanoscale Quantum Optics**
Module type	Required elective module
Educational outcomes, competencies, qualification objectives	Students … will have acquired an advanced knowledge about quantum information processing … will be able to describe sophisticated experiments which are depicting key concepts of quantum information processing ... will know different experimental platforms to perform quantum optics experiments with special focus on quantum information processing ... are able to simulate and verify research work … will be able to extend and develop advanced experimental and theoretical concepts from quantum information processing **Integrated key competencies:** Methodic competency: Students have the ability to apply their knowledge and understanding to develop new ideas in quantum information processing and quantum optics
Types of courses, contact hours	VL 3 SWS S 1 SWS
Contents	**Advanced Nano Scale Quantum Optics – Applications in Quantum Information Processing** Advanced nano scale experiments from quantum information processing, colour centres (also in nano diamonds), quantum information processing with single ions, quantum communication, quantum repeater, quantum computer and algorithms, ultra-precise nano sensors, quantum error correction and experimental implementation on the nano scale, quantum simulation, cavity quantum electrodynamics and Schrödinger-cat states.
Course titles	Advanced Nano Scale Quantum Optics – Applications in Quantum Information Processing
Teaching methods	Lecture, Seminar
Applicability	M.Sc. Physics, M.Sc. Nanoscience
Duration	one semester
Frequency	annually in summer semester
Language	English, for a transitional period lecture notes and exam questions will also be available in German
Recommended Skills	Fundamental knowledge of Quantum mechanics on Bachelor level Nano Scale Quantum Optics
Prerequisites for participation	none
Students workload	Contact time: 60 h, Independent studies: 120 h, Summe = 180 h
Course projects / nongraded learning assignments (Studienleistungen)	Active participation in seminar including exercises and seminar talk presentation
Prerequisites for admission to examination	none
Examination	Written test about lecture contents (ca. 1 h) or oral test (30 min), will be announced at the beginning of the course
Number of credits	6 C (including 1 C for integrated key competencies)
Responsible coordinator	Singer
Lecturer(s)	Dawkins
Media	Blackboard, beamer, online material
Literature	**Advanced Nano Scale Quantum Optics** Gerry & Knight, Introductory quantum optics, Nielsen & Chuang, Quantum Computation and Quantum Information, Cambridge press. Haroche und Raimond, Exploring the quantum, Oxford graduate texts. Lo, Popescu & Spiller, Introduction to Quantum Computation and Quantum Information. Bouwmeester, Ekert & Zeilinger, The Physics of Quantum Information. John Preskill Lecture Notes for Physics 229, Quantum Information and Computation.