Module: Specialization: Advanced Experimental Physics

Module No.: physics62a

Course: Quantum Technology

Course No.: physics642

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	3+1	6	ST

Requirements for Participation:

Preparation:
Quantum mechanics,

Form of Testing and Examination:
Examination written or oral (announced at the beginning of the module).
Prerequisite for participation in the exam: successful work within the exercises.

Length of Course:
1 semester

Aims of the Course:
The aim of the course is to introduce the students to modern applications of quantum physics. Both fundamental concepts of quantum technology as well as platforms for the implementation will be discussed.

Contents of the Course:
Basics of quantum information: Qubits, entanglement, EPR-tests
Quantum communication: Cryptography, teleportation
Quantum computing: circuit computation, paradigms, exotic computation
Quantum simulation
Quantum-enhanced metrology
Selected platforms: Ultracold atoms, single emitters, photonics

Recommended Literature:
S. M Barnett, Quantum information (Oxford University Press 2012)
M.A. Nielsen, I.L. Chuang, Quantum computation and quantum information (Cambridge 2010)
E. Göbel, U. Siegner, Quantum Metrology (Wiley VCH,2015)
W. Nawrocki, Introduction to Quantum Metrology (Springer 2019)
M. Lewenstein, A. Sanpera, V. Ahufinger, Ultracold atoms in optical lattices Simulating quantum many-body systems (Oxford University Press 2012)