Title	Code
Experimental Methods in quantum Engineering and Metrology	**1010402221010420674**
Field: **TECHNICAL PHYSICS**	Year / Semester: **1 / 2**
Specialty: **-**	Course: **core**
Hours: Lectures: **1** Classes: **1** Laboratory: **-** Projects / seminars: **-**	Number of credits: **2**
	Language: **polish**

Lecturer:

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Status of the course in the study program:

Core course of the study for Technical Physics, Faculty of Technical Physics.

Assumptions and objectives of the course:

The course describes ideas, hardware solutions and applications of quantum photonics and optics to computer science, cryptography and quantum metrology

Contents of the course (course description):

Topics of the course:

?Phenomena and quantum model of light, the concept of photon, quantum photonic interferometery , bunching of photons.

?Generation and detection quantum state of light: coherent, squeezed, Fock or photon number states.

?Single photon and entangled pair sources, basic properties of quantum entanglement. Teleportation of photonic states. Quantum random generator.

?Discrete and fibre-optic (linear, polarising, spectral) functional components of quantum photonics. Single photon interferometry.

?Selected concepts of photonic quantum processor architecture.

?The plug and play systems of quantum key distribution with single photons.

?Systems of quantum key distribution with entangled photons.

?Photon-matter interaction: interface for transfer of quantum states.

?Optical cooling of matter.

?Architecture and components for network of quantum key distribution and communication.: quantum memory and repeaters.

?Quantum metrology and imaging systems.

?Atomic time and frequency standards.

Introductory courses and the required pre-knowledge:

fundamentals of quantum engineering or quantum physics, geometrical and wave optics, laser techniques, course on classical physics, elementary quantum and atomic physics,

Courses form and teaching methods:

-lectures supported by multimedia presentation,

-classes: case study on concept and experimental solutions,

Form and terms of complete the course - requirements and assessment methods:

Lectures: written final exam
Classes: continuous assessment of problem solutions

Basic Bibliography:

1. Quantum Optics, an introduction., M. Fox, Oxford University Press, 2007
2. A Guide to Experiments in Quantum Optics , H. A. Bachor, T.C. Ralph, Wiley-VCH, 2004
3. Wstęp do optyki kwantowej, C.C. Gerry, P.L. Knight, PWN, 2007
4. Applied quantum cryptography, Ch. Kollmitzer M. Pivk, Springer, 2010
5. lecture notes, original and review papers

Additional Bibliography:

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