

Course title:	Modern Optics
Institute (Faculty)	Institute of Physics (Faculty of Materials Engineering and Physics)
Number of contact hours:	60 hours
Course duration:	1 semester
ECTS Credits:	4 ECTS

Course Description:

Course goals include providing students with an advanced theoretical knowledge on modern quantum description of light and light-matter interaction together with some practical methods in computer modelling of materials' optical properties and photonic devices in COMSOL Multiphysics. Some prior knowledge and skills related to undergraduate courses in science or engineering will be beneficial, although graduates wishing to specialise in a new area or wishing to convert to a new discipline may also consider taking this course.

The course comprises lectures and tutorials with in-class discussion, substantial element of project-work and self-study.

Learning outcomes will include extensive and advanced knowledge of quantum description of light and light-matter interactions. The course topics will focus on modern applications of quantum unified approach to light-atom interaction, laser theory, modern optical microscopy, quantum computing with light and optical devices. Skills gained upon successful completion of the course will include ability to generate and evaluate scientific and engineering evidence and explanations in the field of modern optics. The students will learn practical and effective methods of modelling optical systems with MATLAB and COMSOL Multiphysics.

Literature:

Y. Band, *Light and Matter: Electromagnetism, Optics, Spectroscopy and Lasers*, Wiley (2006).

G. Grynberg, A. Aspect and C. Fabre, *Introduction to Quantum Optics. From Semi-classical Approach to Quantized Light*, Cambridge University Press (2010).

Course type:	Lectures (30 h), Tutorials (30 h)
Assessment methods:	Attendance, Mid-term tests, Projects, Exam
Prerequisites:	undergraduate Maths, Physics and Computer Science courses
Intended for:	full-time MSc programme at the postgraduate level
Lecturer:	Dr Robert Gębarowski
Contact person:	Dr Robert Gębarowski (rgebarowski@pk.edu.pl)

The course is offered dor Academic Year 2020/2021(version 6.05.2020)