

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE:** Joanna Olesiak-Bańska  
**DEPARTMENT:** Chemical Department  
**SCIENTIFIC DISCIPLINE:** Chemical Sciences

**COURSE CARD**

**Course name in Polish:** Seminarium nanofotoniki  
**Course name in English:** Nanophotonics seminar  
**Course language english**  
**University-wide general course type\*:**  
**The course is intended for all PhD students: YES / NO**

- ~~1) BASIC COURSE~~  
~~2) SPECIALIST COURSE~~  
**3) SEMINAR**  
~~4) HUMANISTIC COURSE~~  
~~5) LANGUAGE~~

**Subject code: NCQ100196S**

\* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)			15	
Grading	Exam	Exam	Oral presentation	Exam, inspection, evaluation classes

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. General chemistry
2. Basics of physics and mathematics
3. Basics of spectroscopy

**COURSE OBJECTIVES**

1. To provide students with a general knowledge on photonics and light-matter interaction
2. To provide students with a knowledge on nanotechnology and advanced materials
3. To provide students with a trends in nanomaterials and photonic materials characterization using spectroscopy and microscopy techniques
4. To provide students with the knowledge on chemistry in nanoscale

**PROGRAM CONTENTS**

<b>Form of classes – seminar (Sem)</b>		Number of hours
Sem1	Introduction to nanophotonics.	1

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND TECHNOLOGY**

Sem2	Multiphoton spectroscopy and microscopy in nanoscale.	1
Sem3	Photoactive materials and nanomaterials.	1
Sem4	Semiconductor nanomaterials in photonics	1
Sem5	Plasmonic materials in photonics	1
Sem6	Nanomaterials for nonlinear optics	1
Sem7	Methods of characterization of nonlinear optical properties of nanomaterials	1
Sem8	Advanced laser spectroscopy of nanomaterials	1
Sem9	Chirality in the nanoscale	1
Sem10	Metamaterials and nanocomposites	1
Sem11	Photonic crystals	1
Sem12	Organic lasers and nanolasers	1
Sem13	Liquid crystals and self-assembly in nanophotonics	1
Sem14	Application of nanomaterials in biology and medicine	1
Sem15	Biomaterials (DNA, proteins) in nanophotonics	1
	Total hours:	15

<b>TEACHING TOOLS USED</b>
N1. Multimedia presentation N2. Discussions during the seminar N3. Students' presentations

<b>ACHIEVED SUBJECT LEARNING OUTCOMES</b>		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8S_WG	student has a sound knowledge of basic subjects such as mathematics, physics, chemistry or others
Knowledge	P8S_WG	has an advanced knowledge fundamental to a field relevant to his/her research, including the most advanced methods of research and verification of results achieved
Skills	P8S_UW	student has scientific and technological skills relevant to methods and methodology of conducting scientific research and critical evaluation of the results obtained
Skills	P8S_UK	is able to prepare and present an oral and multimedia presentation in English on the implementation of the research and to lead a discussion on the presented presentation.

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**PRIMARY AND SECONDARY LITERATURE**

**PRIMARY LITERATURE:**

- [1] Paras N. Prasad, Nanophotonics, Wiley-Interscience, 2004
- [2] K. D. Sattler, Handbook of nanophysics, CRC Press, 2011
- [3] B. E. A. Saleh, M. Carl Teich “Fundamentals of Photonics” John Wiley & Sons, Inc. 2007
- [4] R. L. Sutherland, “Handbook of nonlinear optics” Marcel Dekker, Inc. 2003
- [5] L. Novotny B. Hecht, “Principles of Nano-Optics”, Cambridge (2006)
- [6] Research papers in the dedicated journals

**SECONDARY LITERATURE:**

- [1] Robert Boyd, „Nonlinear Optics 4th Edition” Academic Press 2019
- [2] Eugene Hecht, „Optics 5th Edition” Pearson 2016

**SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)**

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