

COURSE CARD

1. Basic information

Course name in English:	Nanophotonics seminar	
Course name in Polish:	Seminarium nanofotoniki	
Number of hours:	15	
Type of course:	Elective course	
Form of course:	seminar	
Code of course:		
Course leader:	Dr hab. inż. Joanna Olesiak-Bańska, prof. uczelni, dr hab. inż. Lech Sznitko, prof. uczelni	
Faculty of the course leader:	W3 Faculty of Chemistry	
Email address of the course leader:	Joanna.olesiak-banska@pwr.edu.pl	
Scientific discipline(s) assigned to	Architecture and urban planning	
the course (doctoral students representing the marked	Automation, electronic, electrical engineering and space technologies	
disciplines can participate in the	Information and communication technology	
course):	Biomedical engineering	\boxtimes
	Chemical engineering	\boxtimes
	Civil engineering, geodesy and transport	
	Materials engineering	\boxtimes
	Mechanical engineering	\boxtimes
	Environmental engineering, mining, and energy	\boxtimes
	Mathematics	\boxtimes
	Chemical sciences	\boxtimes
	Physical sciences	\boxtimes
	Management and quality studies	

2. Objectives

The objectives of the course:

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

3. Content

Detailed information about the course content, including topics and form of classes.

No.	Topic	Number of	Form of classes
		hours	



1	Introduction to nanophotonics	lecture
2	Light in nanoscale	lecture
3	Photoactive materials and nanomaterials	lecture
4	Semiconductor nanomaterials in photonics	seminar
5	Plasmonic materials in photonics	seminar
6	Nanomaterials for nonlinear optics	seminar
7	Methods of characterization of optical properties of	seminar
	nanomaterials	
8	Advanced laser spectroscopy of nanomaterials	seminar
9	Chirality in the nanoscale	seminar
10	Metamaterials and nanocomposites	seminar
11	Photonic crystals	seminar
12	Organic lasers and nanolasers	seminar
13	Self-assembly in nanophotonics	seminar
14	Application of nanophotonics in biology and medicine	seminar
15	Biomolecules (DNA, proteins) in nanophotonics	seminar

4. Prerequisites

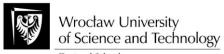
List of prerequisites relating to knowledge, skills and other competences for course participants.

- 1. General chemistry
- 2. Basics of physics and optics
- 3. Basics of spectroscopy

5. Learning outcomes

List of learning outcomes at level 8 of the Polish Qualifications Framework assigned to the course (mark the learning outcomes in the last column).

Symbol	Learning outcome	
	KNOWLEDGE. Doctoral student knows and understands:	
SzD_W3	the main trends in the development of the scientific or artistic disciplines covered	×
	in the curricula;	
SzD_W4	research methodology;	
SzD_W5	the rules for the dissemination of scientific results, including in open access	
	mode;	
SzD_W6	the fundamental dilemmas of modern civilization;	
SzD_W7	the legal and ethical conditions of scientific activity;	
SzD_W8	the economic and other relevant conditions of scientific activity;	
SzD_W9	basic principles of knowledge transfer to the economic and social spheres and	\boxtimes
	commercialisation of results of scientific activity and know-how related to these	
	results.	
	SKILLS. Doctoral student is able to:	



Doctora	

SzD_U2 use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks, in particular: - define the purpose and subject of scientific research, formulate a research	
particular:	
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- define the purpose and subject of scientific research, formulate a research	1
hypothesis,	
- develop research methods, techniques and tools, and use them creatively,	
- draw conclusions on the basis of scientific research;	
critically analyse and evaluate the results of scientific research, expertise and	
other creative work and their contribution to knowledge development;	
transfer the results of scientific activities to the economic and social spheres;	
SzD_U3 communicate on specialised topics to the extent that they enable an active	\boxtimes
participation in the international scientific community;	
SzD_U4 disseminate research results, including in popular forms;	\boxtimes
SzD_U5 initiate debates and participate in a scientific discourse;	\boxtimes
SzD_U6 be able to speak a foreign language at B2 level of the Common European	
Framework of Reference for Languages to a level that enables them to participate	
in the international scientific and professional environment;	
SzD_U7 plan and implement an individual or collective research or creative activity,	
including in an international environment;	
SzD_U8 independently plan and act for one's own development and inspire and organize	
the development of others;	
SzD_U9 plan classes or groups of classes and implement them using modern methods and	
tools.	
SOCIAL COMPETENCES. Doctoral student is ready to:	
SzD_K3 fulfilling the social obligations of researchers and creators, initiate public interest	\boxtimes
activities, thinking and acting in an entrepreneurial way;	
SzD_K4 maintaining and developing the ethos of research and creative environments,	
including:	
- carrying out scientific activities in an independent manner,	
- respecting the principle of public ownership of research results, taking into	
account the principles of intellectual property protection.	

6. Evaluation

Short description of the method(s) used to evaluate the learning outcomes assigned to the course, e.g., exam, test, report, presentation, etc.

PhD student will be evaluated via presentation on the topic related to nanophotonics. In the evaluation the following issues will be taken into account:

scientific content of the presentation

quality of presentation (how it was delivered by the student, how (s)he answered questions from the audience etc.)

quality of slides (how clear, informative and attractive for the audience are the slides

7. Teaching methods

Short description of the teaching methods used during the course, e.g., multimedia presentation, discussion, literature studies, developing written documents, own work, etc.



Multimedia presentation, Discussions during the seminar, Literature studies, Students' presentations.

8. Literature

List of primary and secondary literature used to prepare the course and including additional knowledge for participants, e.g., books, textbooks, research papers, standards, web pages, etc.

- [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)

9. Other remarks

Additional remarks, comments, (e.g., language of the course)

The course is conducted in English.