

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

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE: dr hab Jan Masajada, prof. ucz.

**DEPARTMENT:** Faculty of Basic Technical Problems W11

**SCIENTIFIC DISCIPLINE:** Physical Sciences

**COURSE CARD**

**Course name in Polish:** Promienie fale i fotony

**Course name in English:** Rays waves and photons

**Course language** Polish

**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:** NFQ100053W

\* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30	-	-	-
Grading	Exam			
Number of ECTS points	<b>0</b>			

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

1. Introductory course in physics
2. Introductory course in mathematical analysis

**COURSE OBJECTIVES**

- C1 acquire knowledge in the field of geometrical optics
- C2 acquire knowledge in the field of wave optics
- C3 acquire knowledge in the field of quantum optics

**PROGRAM CONTENTS**

<b>Form of classes – lecture (Lec)</b>		Number of hours
Lec1	Introduction to the course, fundamental problems in theoretical	2

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	description of optical phenomenon	
Lec2	Introduction to the theory of vision; physical and philosophical issues.	2
Lec3	Fermat principle, geometrical optics, instruments	2
Lec 4	Caustics and limits of the ray theory	2
Lec 5	Huygens – Fresnel principle – introduction to wave theory	2
Lec 6	Diffraction in the far field regime	2
Lec 7	Diffraction in the near field regime	2
Lec 8	Wave theory of image formation	2
Lec 9	Classical and synthetic holography	2
Lec 10	Coherence theory.	2
Lec 11	Superresolution microscopy	2
Lec 12	Special and general theory of relativity	2
Lec 13	Introduction to quantum mechanic	2
Lec 14	The physics of photon	2
Lec 15	Quantum entanglement	2
	Total hours:	<b>30</b>

**TEACHING TOOLS USED**

- N1. Lecture with multimedia presentation  
 N2. Literature prepared by author available via internet  
 N3. Individual study and preparation for the exam

**ACHIEVED SUBJECT LEARNING OUTCOMES**

Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8U_W	Exam
Skills	P8U_UW	Exam
Skills	P8S_UU	Exam
Social competence	P8S_KK	Exam
Social competence	P8S_KR	Exam
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**PRIMARY AND SECONDARY LITERATURE**

**PRIMARY LITERATURE:**

- [1] Materiały do wykładów
- [2] K. Gniadek „Optyczne przetwarzanie informacji”, PWN 1992
- [3] W. T. Cathey, Optyczne przetwarzanie informacji i holografia, PWN 1978
- [4] R. K. Luneburg, “Matematyczna teoria optyki”, PWN, 1993
- [5] E. Hecht Optyka, PWN, 2013

**SECONDARY LITERATURE:**

- [1] Artykuły z czasopism specjalistycznych

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

**Jan Masajada, jan.masajada@pwr.edu.pl**