GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physical Optics, PG_00045769		
Field of study	Technical Physics		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Specialty subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Division of Atomic Molecular and Optical Physics -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Mykola Shopa	
	Teachers	dr Mykola Shopa	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	0.0	0.0	15.0	60

E-learning hours included: 0.0

eNauczanie source address: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26559

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	60	5.0	35.0	100

Subject objectives

Students learn about the most important aspects of physical optics, in particular contemporary directions of optical research.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U09] can popularize the achievements in physics and related fields of science	The student possesses knowledge of modern trends in optical research and is able to describe, explain, and popularize them.	[SU3] Assessment of ability to use knowledge gained from the subject
[K7_W02] has enhanced, theoretically-founded, detailed knowledge of selected field of physics, and sufficient knowledge of related fields of science or technology	The student acquires structured knowledge within the scope of the Physical Optics course. In particular, they learn the basics of selected optical experiments and are able to use mathematical tools to calculate the interaction of light with matter, including scattering and the passage of light through various media.	[SW1] Assessment of factual knowledge
[K7_U07] has enhanced skill of preparing speeches in Polish and English, including presentation of own research results	The student gives a seminar on experimental and theoretical methods of selected optical problems, leads a discussion and answers questions.	[SU5] Assessment of ability to present the results of task

Subject contents	Course content – lecture History of optics Electromagnetic spectrum and black body radiation Electromagnetic waves Light sources, lasers Polarization control Lights impulses Optical activity Maxwell equations Light interaction with matter Metamaterials Light scattering Nanoscale optical phenomena, surface plasmons Nonlinear optics Ultrafast optics Course content – exercises Calculation exercises in the following areas: - geometric optics - electrodynamics (EM radiation) - light dispersion - light polarization - light propagation in optically anisotropic media Course content – seminar Seminars on selected optical topics. Sample seminar topics: - The Cherenkov Effect - Discovery, Theory, and Applications - G. Lippmann's Color Reproduction Method - Optical Metamaterials - Light Pressure - Discovery, Theory, and Applications
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
practice, test	50.0%	25.0%
lectures, exam	50.0%	50.0%
seminar	50.0%	25.0%

Recommended reading	Basic literature	D. Meschede Optics, Light and Lasers, Wiley-VCH (2004) M. Born, E. Wolf Principles of Optics, Pergamon (1970+) E. Hecht Optics, Addison-Wesley (1974+) D. Griffiths "Introduction to Electrodynamics". (1999)
	Supplementary literature	G. Chartier Introduction to Optics, Springer (2005) M. Fox Optical properties of Solids, Oxford (2001)
	eResources addresses	
Example issues/ example questions/ tasks being completed	Derivation of the wave equation for EM waves, energy density, and energy flux. Solution of the problem of light scattering by spherical particles (Mie Theory) Derivation of physical conditions for metamaterials Anisotropic materials, anisotropic phenomena Wave polarization eigenstates in an anisotropic crystal Phase-matching type I and type II	
Practical activites within the subject	Not applicable	

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