

Subject card

Subject name and code	Optics and Waves, PG_00182149						
Field of study	Medical Physics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study 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	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		4.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Division of Atomic and Molecular Physics -> Institute of Experimental Physics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Dzmitryi Ushakou				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 0.0						
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		0.0		60.0	120
Subject objectives	To familiarise students with the basic concepts of mechanical waves and optics. As part of optics, to learn about its laws and the basics of how optical instruments work.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[FIZMEDL3_U01] He can formulate, analyse, and solve complex problems in physics and medicine, using mathematical formalism, based on the physical phenomena, principles, and theories he has learned.		The student is able to: describe mechanical waves quantitatively; formulate the basic laws of geometric optics; describe optical phenomena; indicate the limitations of geometric optics in the analysis of optical phenomena.		[SU1] oral statement/conversation/discussion [SU3] text preparation/written work [SU4] test/exam - oral or written [SU5] implementation of a problem task		
	[FIZMEDL3_W01] Knows and understands at an advanced level the phenomena, principles, laws and theories specific to physics and biophysics.		The student knows: basic physical quantities describing wave motion and mathematical formalism used in the description of mechanical waves; basic concepts of optics; basic optical phenomena; principles of optical instrument construction; basic principles of geometric optics.		[SW4] test/exam - oral or written [SW1] oral statement/conversation/discussion [SW3] text preparation/written work [SW5] implementation of a problem task		

Subject contents	Waves 1. Mechanical waves (including acoustic waves). Harmonic oscillations. 2. Wave phenomena. Wave interference (principle of superposition), beating, standing waves. 3. Damped oscillations. Subcritical and supercritical damping. Optics 1. The principles of geometric optics. Basic components of optical systems: lenses, spherical and plane mirrors, prisms and wedges. 2. The principles of visual photometry. Luminous flux, luminous power, illuminance, emittance and luminance. 3. Monochromaticity of radiation. Coherence of electromagnetic waves. The phenomenon of light interference. Basic types of interferometers. 4. Thin-film interference. Anti-reflective coatings based on the phenomenon of interference. 5. Diffraction of light. The Huygens–Fresnel principle. Diffraction gratings. 6. Polarization of light. The phenomenon of birefringence. Polarizing elements. 7. The photoelectric effect.		
Prerequisites and co-requisites	Knowledge of mathematical analysis and the principles of physics.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	not applicable	51.0%	30.0%
	not applicable	51.0%	30.0%
	not applicable	51.0%	40.0%
Recommended reading	Basic literature	not applicable	
	Supplementary literature	not applicable	
	eResources addresses		
Example issues/ example questions/ tasks being completed	not applicable		
Work placement	Not applicable		

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