University of Gdańsk

Subject card

Subject name and code	Physical Laboratory I - Thermodynamics, Optics and Waves, PG_00182156		
Field of study	Medical Physics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
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	4	ECTS credits	3.0
Learning profile	academic	Assessment form	credit
Conducting unit	Faculty of Mathematics, Physics and Informatics -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Joanna Gondek	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	45.0	0.0	0.0	45
	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	45	0.0	45.0	90

Subject objectives	Deepening knowledge and understanding of thermodynamic, optical, and wave phenomena by conducting laboratory experiments independently and analyzing and interpreting their results.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[FIZMEDL3_U08] Can prepare a written paper or presentation in Polish or English using specialised terminology in the field of physics and medical physics.	The student is able to: – use basic computer software packages to theoretically present an experimentally studied phenomenon, present the obtained measurement data and their analysis.	[SU1] oral statement/conversation/discussion [SU2] presentation/project/paper/report
	[FIZMEDL3_U02] He can perform measurements of physical quantities, prepare, describe, and present the results of physical experiments, including the estimation of measurement uncertainties, and perform quantitative analyses and formulate qualitative conclusions based on them.	The student is able to: – use theoretical knowledge of thermodynamics, optics, and waves to conduct experiments in these areas of physics; – apply mathematical apparatus to describe and analyze independently obtained experimental data and their uncertainties; – perform a quantitative analysis of the studied phenomenon and formulate qualitative conclusions based on it.	[SU1] oral statement/conversation/discussion [SU2] presentation/project/paper/report
	[FIZMEDL3_W09] Knows at an advanced level the construction and operating principles of measurement instruments, electronic systems, and diagnostic and therapeutic equipment used in physics research and in medical diagnosis and therapy.	Student: – is familiar with the measuring equipment used in the study of thermodynamic, optical, and wave phenomena and understands how it works.	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report
	[FIZMEDL3_U09] Can communicate effectively with colleagues and other employees, works in a team, including interdisciplinary teams, and manages his/her own and his/her colleagues' time appropriately.	The student is able to: – plan, coordinate, and conduct research work requiring the cooperation of a group of people, – formulate questions and problems related to the research being conducted; – publicly analyze the results of measurements, observations, and theoretical calculations, – accept critical analysis of their results of measurements, observations, and theoretical calculations, – apply the knowledge and methodology of physics and its experimental methods to related scientific disciplines. – adhere to the principles of professional ethics by performing the tasks assigned to them in a reliable and timely manner.	[SU1] oral statement/conversation/discussion [SU2] presentation/project/paper/report
	[FIZMEDL3_W04] Knows and understands the role of a physical experiment and the elements of the theory of measurement uncertainty.	The student knows and understands: – basic models, quantities, and physical laws of thermodynamics, optics, and waves; – the role of physical experiments in understanding the regularities of physical phenomena; – the principles of planning, performing physical experiments, and analyzing their results; – the principles of processing measurement data; – units of physical quantities in thermodynamics, optics, and waves; – the structure and operating principles of basic measuring instruments used in physical experiments in thermodynamics, optics, and waves; – the basics of numerical analysis and basic software packages for presenting results and analyzing measurement data.	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report

Subject contents	Measurement methods in thermodynamics, geometric optics, and wave optics using electronic techniques. Measurement planning, construction of measurement systems, performance of measurements, assessment of measurement uncertainty. Experimental study of the basic regularities of phenomena and properties of thermodynamic and optical systems: determination of the Cp/Cv ratio using the Clement-Desormes method, determination of the gas compressibility coefficient using a gas thermometer, determination of the thermal expansion coefficient of solids, determining the dependence of the boiling point on pressure and the heat of vaporization of water, determining the heat of fusion of ice using a calorimeter, determining the change in entropy of the system, determining the thermal conductivity coefficient of air, determining the specific heat of water, determining the adiabatic exponent for air, determining the work done on gas in adiabatic and isothermal thermodynamic processes, determining the diffraction grating constant and measuring the wavelength of light using a diffraction grating, analyzing gas emission spectra using a prism spectroscope, diffraction and interference of laser light, determining the focal lengths of thin lenses, study of the photoresistor, testing a photoresistor, measuring extinction using a spectrophotometer, determining the radius of curvature of a lens using Newton's rings, determining the specific rotation of a sugar solution using a polarimeter, determining the refractive index and magnification of a microscope lens, determining the diffusion coefficient of a liquid using an optical method, determining the refractive index of a medium by measuring the angle of minimum deviation of a prism, study of the polarization of light, Malus' law,

	examining local changes in the thickness of flat-parallel plates using a Haidinger interferometer, determining the change in the refractive index of air using a Jamin interferometer.
Prerequisites and co-requisites	
Assessment methods and criteria	see table below

Subject passing criteria	Passing threshold	Percentage of the final grade
reports	51.0%	60.0%
oral responses	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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