



Subject card

Subject name and code	Laboratory of the basics of modern physics, PG_00049440						
Field of study	Technical Physics						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2028/2029		
Education level	first-cycle studies	Subject group			Optional 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	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	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 inż. Ireneusz Linert					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30
	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	30		2.0		18.0	50
Subject objectives	<p>The aim of this course is to familiarize students with topics in contemporary physics (primarily nuclear physics) through hands-on laboratory activities.</p> <p>Through these laboratory activities, students will expand and consolidate their knowledge of contemporary physics, learn new experimental techniques, master the operation and use of measurement equipment, and become skilled at planning and conducting measurements. Additionally, they will consolidate their knowledge of measurement error analysis and methods for processing and presenting results.</p>						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U08] communicates effectively using specialist terminology in physics and related disciplines, enabling the preparation of reports, publications or presentations, as well as participation in discussion and expression of opinions.	The student is able to prepare a report on the conducted experiment using specialized terminology in the field of physics.	[SU1] Assessment of task fulfilment
	[K6_U04] is able, individually or in a team, to plan and conduct experiments in physics and related fields, including applied computer science or energy engineering, and to analyse and interpret results and formulate conclusions.	Students can plan and conduct experiments in contemporary physics, working individually or in a team (laboratory group). Students acquire the ability to operate and read data from Vernier scale instruments. Students can operate high-voltage power supplies, various types of ionizing radiation counters, electrometers, and instruments used in contemporary physics. Students can assess measurement errors using various uncertainty calculation techniques, and in the case of nuclear physics, statistical methods related to Gaussian and Poisson distributions. Students can also, using computer programs, prepare results in the form of a report, comparing the obtained results of physical quantities with table values or the results of theoretical calculations. They can draw conclusions regarding the obtained results and the accuracy of the conducted experiment. Students can think logically and formulate conclusions.	[SU1] Assessment of task fulfilment
	[K6_W04] has advanced knowledge of the principles of experimental design, experimental methods, measurement techniques and scientific equipment used in physics and related sciences, including their life cycle.	The student possesses knowledge related to planning and conducting an experiment. The student is familiar with physical phenomena from contemporary physics related to the experimental topic. They understand that measurement errors can be minimized by repeating the experiment under varying conditions, and in the case of measuring the activity of radioactive isotopes, by extending the measurement time. The student is familiar with various methods and techniques for measuring radioactivity (using an ionization chamber, Geiger-Muller counter, scintillator), as well as the generation and detection of atomic spectra, techniques for measuring the photoelectric effect, the Hall effect, the temperature dependence of electrical conductivity, the generation and control of electron and positron beams using electric and magnetic fields, the determination of the electron e/m ratio, and the study of the Stefan-Boltzmann law.	[SW1] Assessment of factual knowledge
Subject contents	Course content – laboratory Studying the absorption of alpha, beta, and gamma radiation, determining the range of alpha particles in air, investigating the inverse-square law for beta and gamma radiation, measuring half-life, measuring the electrical conductivity of semiconductors, measuring the atomic spectra of sodium, helium, and hydrogen, and determining the Rydberg constant for hydrogen. Determination of the e/m ratio. Study of the photoelectric effect. Study of the Stefan-Boltzmann law. Determination of the Hall constant.		
Prerequisites and co-requisites	1) Knowledge of fundamentals of modern physics. 2) Ability to use differential and integral calculus.		

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Carrying out measurements and preparing a report	80.0%	40.0%
	theoretical preparation for exercises	50.0%	60.0%
Recommended reading	Basic literature	1) Fundamentals of physics Resnick Robert, Walker Jearl, Halliday David, PWN 2015 2) University physics, Openstax, https://openstax.pl/en/books	
	Supplementary literature	Nuclear Physics: A Very Short Introduction, Close Frank, Oxford University Press, 2015	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Radioactive decays, radiation absorption law, radioactive decay law, scintillation counter, Geiger-Muller counter, ionization chamber, alpha, beta, and gamma particles. Bohr's model of the hydrogen atom, diffraction grating, atomic spectra.		
Practical activities within the subject	Not applicable		

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