GDAŃSK UNIVERSITY OF TECHNOLOGY

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 2025	Academic year of realisation of subject	2027/2028
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

The aim of this course is to familiarize students with topics in contemporary physics (primarily nuclear physics) through hands-on laboratory activities.

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.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W08] has knowledge of planning and conducting physical experiments, and critical analysis of its results	The student understands the need to repeat a given measurement or extend its duration to reduce measurement error. The student knows and applies techniques for analyzing measurement uncertainty, including the method and accuracy of recording obtained results. The student knows and understands the physical phenomena related to the subject of the experiment.	[SW1] Assessment of factual knowledge
[K6_U04] plans and conduct experiments, critically analyzes their results, draw conclusions and forms opinions, has laboratory work experience	The student acquires knowledge and skills related to conducting measurements and analyzing measurement errors. The student understands the need to repeat a given measurement or extend its duration to reduce measurement error. The student understands and applies techniques for analyzing measurement uncertainty, including the method and accuracy of recording obtained results. The student can use software for various measuring instruments. The student can record and present measurement results in concise and clear tables and graphs. The student understands that measurement results should be compared with theoretical predictions and/or tabulated data. The student is proficient in using software for processing measurement data and preparing documentation/reports. The student develops logical thinking and the ability to draw conclusions.	[SU1] Assessment of task fulfilment
[K6_W07] has knowledge of the construction and operation of physical instruments, measurement and research equipment	The student understands the operation of measuring instruments and is able to operate them. Examples of instruments include: power supplies, frequency meters, scintillation counters, Geiger-Muller counters, multimeters, and instruments for measuring length, thickness, and angles using the Vernier scale (e.g., calipers, micrometers). The student knows and understands the physical phenomena associated with the operation of a given instrument or measuring apparatus.	[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.

Prerequisites and co-requisites

1) Basic knowledge of 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 activites within the subject	Not applicable	

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