University of Gdańsk

Subject card

Subject name and code	Basics of Physics - Lecture, PG_00212213						
Field of study	Criminology						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2026/2027			
Education level	Master's studies		Subject group	Optional subject group			
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	2.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Faculty of Law and Administration -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Anna Synak					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	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		0.0	20.0	50	
Subject objectives	**Course objectives:** • To learn the fundamental laws and principles of physics. • To understand the physical phenomena underlying physicochemical examinations in forensic science. • To become familiar with various physical quantities and their units of measurement. • To learn how to formulate research problems for commissioned expert examinations using the language and concepts of physics.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[KRYMMU2_W06] Has in-depth knowledge and is familiar with the terminology used in psychology, sociology, and related disciplines applied in criminology, and understands the fundamental dilemmas of contemporary civilization associated with these fields. The graduate is also familiar with the basic principles of intellectual property and copyright protection, as well as the conditions for the creation and development of various forms of entrepreneurship.	The student characterizes fundamental laws and physical phenomena applicable to forensic science and explains their significance for the identification and analysis of evidence. The student explains the physical principles underlying selected research methods used in forensic examinations, including methods based on the mechanical, thermal, electrical, and optical properties of matter. The student distinguishes between physical quantities relevant to forensic examinations, uses appropriate terminology, and identifies relationships between the analyzed quantities. The student understands the importance of measurement, accuracy, and measurement uncertainty, and identifies factors that may affect the reliability of results obtained from physical and physicochemical examinations used in forensic science. The student explains the possibilities and limitations of applying methods based on the laws of physics to the examination of traces and evidence and understands the need for critical interpretation of the obtained results. The student understands the interdisciplinary nature of forensic examinations and identifies connections between physics and other fields of knowledge used in investigative and evidentiary processes. The student understands the importance of properly formulating research problems and questions addressed to forensic experts and is able to identify the physical information necessary for the appropriate planning of a forensic examination.	[SW4] test/exam - oral or written

Course outcome	Subject outcome	Method of verification
[KRYMMU2_W01] Has in-depth knowledge of the nature of legal sciences and penal sciences, their place within the system of sciences, their mutual relationships, and the main directions of their development, as well as their connections with other fields of science and the axiological and social determinants of activities related to counteracting crime.	The student explains the importance of knowledge of physics for the development of forensic science and its application in the detection, collection, and examination of forensic traces. The student identifies the relationships between physics and forensic science and explains the role of physical and physicochemical methods in examinations conducted for the purposes of criminal proceedings. The student characterizes the application of fundamental laws of physics in the analysis of evidence and the interpretation of phenomena relevant to forensic science. The student understands the importance of the interdisciplinary application of developments in physics, chemistry, and other natural sciences in the advancement of modern forensic methods. The student explains how the development of measurement methods and research instrumentation affects the possibilities of detecting, identifying, and analyzing forensic traces and other evidence. The student identifies the possibilities and limitations of applying physical methods in forensic examinations and understands their importance for the reliability of conclusions formulated for evidentiary purposes. The student understands the role of physical knowledge in the proper formulation of research problems and the selection of methods used in forensic examinations and expert analyses.	[SW4] test/exam - oral or written

Course outcome	Subject outcome	Method of verification
[KRYMMU2_K01] Is aware of the level of their knowledge and skills, critically evaluates them, understands the need for lifelong learning, and recognizes the importance of knowledge in solving cognitive and practical problems; when unable to solve a problem independently, seeks the opinions of experts.	The student critically assesses their own level of knowledge of physics and its application to solving forensic problems. The student recognizes the need to systematically update their knowledge of physical and physicochemical methods used in forensic examinations. The student understands the importance of reliable scientific knowledge in analyzing and solving problems related to the examination of evidence. The student is aware of the limitations of their own knowledge and competence in interpreting physical phenomena encountered in forensic examinations. The student is able to identify situations requiring consultation with a specialist or forensic expert possessing specialized knowledge of physics or physicochemical methods. The student demonstrates readiness to critically evaluate measurement and examination results and to consider their limitations when drawing conclusions concerning evidence. The student recognizes the importance of cooperation with specialists from different scientific disciplines in solving complex research and practical problems encountered in forensic science.	[SK4] test/exam - oral or written

Subject contents

Given the target audience of the course, mathematical derivations of the laws and principles of physics will be omitted. Instead, emphasis will be placed on the relationships between different physical quantities and on the analysis of physical phenomena in terms of their relevance and application in various physical and physicochemical methods used in forensic examinations.

Lecture topics:

- Kinematics and dynamics of a material point and a rigid body.
- Conservation laws: conservation of momentum, angular momentum, and energy.
- Oscillations and waves.
- Elements of fluid mechanics.
- Thermodynamics of physical processes.
- Electromagnetism: electrical and magnetic properties of matter, electric and magnetic fields, and electromagnetic waves.
- Geometrical and wave optics.
- Atomic and molecular physics: atomic structure, atomic and molecular spectra.
- Elements of nuclear physics: properties of atomic nuclei and radioactivity.

Prerequisites and co-requisites

Not applicable

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
test	51.0%	100.0%

Recommended reading

Basic literature

Holliday D.: Resnick R.: Walker J., Podstawy Fizyki, tomy 1-5, Wydawnictwo Naukowe PWN, Warszawa 2005/2006M.A. Herman, A. Kalestyński, L. Widomski Podstawy fizyki dla kandydatów na wyższe uczelnie, Wydawnictwo Naukowe PWN, Warszawa, 9, 2012A.Wróblewski, J.Zakrzewski, Wstęp do fizyki, PWN, Warszawa 1984.

	Supplementary literature	Atkins P.W., Chemia fizyczna, Wydawnictwo Naukowe PWN, Warszawa 2007R.P Feynman, R.B. Leighton, M.Sands, Feynmana wykłady z fizyki, 1-3,PWN, 2011/2012.
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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