



## Subject card

Subject name and code	Physics, PG_00058177						
Field of study	Green Technologies						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study		
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			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Physics of Electronic Phenomena -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jędrzej Szmytkowski				
	Teachers		dr hab. inż. Jędrzej Szmytkowski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	30.0	0.0	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		10.0		80.0	135
Subject objectives	The aim is to demonstrate laws of physics						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_U05] can formulate and solve engineering tasks analytical methods, simulation as well as experimental, able to apply knowledge of basic physics and mathematics to analyze the results of experiments, is able to analyze and assess existing technical solutions	Student knows how to use law of physics in daily life			[SU3] Assessment of ability to use knowledge gained from the subject		
	[K6_W01] has a basic knowledge from some branches of mathematics and physics useful for formulating and solving simple problems in the field of environmental technologies and modern analytical methods	Student knows physics and mathematics, which are used in environmental technologies.			[SW1] Assessment of factual knowledge		
	[K6_K02] is aware of the social role of a technical college graduate, take the reflections on the ethical, scientific and social aspects of the work performed, understands the need to promote, formulating and providing the public with information and opinions concerning the activities of the profession of engineer.	Student is prepared to be engineer			[SK5] Assessment of ability to solve problems that arise in practice		

Subject contents	<p>About physics. Physical quantities and their units. Elements of vector algebra. Kinematics of a particle: linear motion, circular motion, Newton's laws of motion. Dynamics of rigid body: the moment of inertia, principal axes, Steiner's law, torque and angular momentum, equation of rotational motion, gyroscopes and precession. Conservation laws in mechanics. Pressure in a Liquid at Rest. Pascal's Principle and Archimedes' Principle. Bernoulli's Law. Oscillations and mechanical waves. Simple, damped and driven vibrations. Mechanical resonance. Beats. Types of waves. The equation of motion for harmonic plane waves. Wave velocity. Examples of diffraction and interference of waves. Standing waves. Doppler effect. Sound intensity level.</p> <p>The following problems will be realized if we will have enough time:</p> <p>Temperature and Heat. Laws of Thermodynamics. Electric field. Coulomb's law. The intensity of the electric field. The electrical potential. The relationship between the intensity of the electric field and potential. An electric dipole and its behavior in an external electric field. Capacitance of the electric capacitor. Comparison of basic characteristics of the electric field and gravity. Magnetic field. Magnetic induction vector. The Lorentz force. Biot-Savart law. Electrodynamical force. The interaction of two straight linear wires carrying an electric current. Magnetic dipole and its behavior in an external magnetic field.</p>											
Prerequisites and co-requisites	Mathematics and physics from lyceum											
Assessment methods and criteria	<table border="1" data-bbox="451 663 1487 701"> <thead> <tr> <th data-bbox="451 663 794 701">Subject passing criteria</th> <th data-bbox="794 663 1137 701">Passing threshold</th> <th data-bbox="1137 663 1487 701">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 701 794 730">Lecture: Written exam</td> <td data-bbox="794 701 1137 730">50.0%</td> <td data-bbox="1137 701 1487 730">60.0%</td> </tr> <tr> <td data-bbox="451 730 794 768">Tutorials: Written tests</td> <td data-bbox="794 730 1137 768">50.0%</td> <td data-bbox="1137 730 1487 768">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Lecture: Written exam	50.0%	60.0%	Tutorials: Written tests	50.0%	40.0%
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Recommended reading	Basic literature	1. D. Halliday, R. Resnick, J. Walker, Fundamentals of physics, Wiley 2008  2. W.S. Wolkensztejn, Problems in Physics, PWN 1974										
	Supplementary literature	1. J. Orear, Physics, Macmillan Publishing Co, 1979  2. W. Hajko, Physics in Examples, WNT 1967										
	eResources addresses	Adresy na platformie eNauczanie:										
Example issues/ example questions/ tasks being completed	1. Moment of inertia . Determination of the moments of inertia of molecules 2. The principle of conservation of angular momentum. 3. Examples of harmonic oscillators : simple and physical pendulum, the weight attached to a spring 4. Damped motion. During time $t_1$ the amplitude of vibrations decreased $n_1$ times. How many times will decrease the amplitude of vibrations in the time $t_2$ ? 5. Doppler effect. 6. Comparison of the basic features of the gravity and electrostatic fields 7. Comparison of the basic features of the electrostatic and magnetostatic fields 8. Electric dipole . Electric dipole moment . The behavior of the dipole in an external electric field. 9. Magnetic dipole. The magnetic dipole moment. The behavior of the dipole in an external magnetic field 10. The interaction between two straight parallel conductors carrying electric current . The definition of the ampere 11. Lorentz force. Definition of tesla. Motion of charge on a circular orbit in a uniform magnetic field. 12. Motion of charge in electric field ( $mv^2 / 2 = eU$ ) . Definition of electronvolt 13. Capacitor and coil. Capacitance and inductance. Definition of farad and henry.											
Work placement	Not applicable											