



## Subject card

Subject name and code	Physics, PG_00038427						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2022/2023		
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		7.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Metrology and Information Systems -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Maciej Łuszczek				
	Teachers		dr inż. Maria Chomka				
			dr hab. inż. Maciej Łuszczek				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	30.0	0.0	0.0	0.0	75
	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	75		10.0		90.0	175
Subject objectives	Introduction to the basic laws of physics. Understanding of the role of physics in our environment and introduction of the methods of mathematically precise description of natural phenomena. Implementation of the differential and integral calculus in physical problems.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_K02] can work in a group taking on different roles in it						
	[K6_W02] has basic knowledge of physics and chemistry including electrostatics, electromagnetism, electrodynamics, wave motion, acoustics, mechanics, thermodynamics, optics, solid state physics; including knowledge necessary to understand the basic physical phenomena occurring in hydrogen devices, systems and installations as well as automation and robotics systems						
	[K6_U01] Is able to obtain information from literature, databases and other sources, integrate them, interpret them and draw conclusions and formulate opinions; has the ability to self-educate m.in. in order to improve professional competences		Student is able to use various bibliographic resources and can make correct conclusions.		[SU1] Assessment of task fulfilment		

Subject contents	<p><b>1. Mechanics</b></p> <p><b>Kinematics:</b> basic concepts and quantities, rectilinear motion with constant acceleration, relativity of motion, projectile motion, circular motion.</p> <p><b>Dynamics:</b> Newton's principles, inertial and non inertial reference systems, transnational motion dynamics, rotational motion dynamics</p> <p><b>Conservation laws in dynamics:</b> conservation of energy, momentum and angular momentum</p> <p><b>2. Gravity:</b> Newton's law of universal gravitation, gravitational potential energy, escape velocity</p> <p><b>3. Vibrations and waves.</b></p> <p><b>Simple harmonic motion:</b> equation of motion. energy, mathematical pendulum, physical pendulum, superposition of harmonic motions</p> <p><b>Damped harmonic motion.</b></p> <p><b>Forced vibrations and resonance.</b></p> <p><b>Waves in elastic media:</b> classification of waves, wave propagation, superposition of waves, standing waves.</p> <p><b>Sound waves:</b> audible sounds, ultra- and infrasound, standing acoustic waves, beats, Doppler's effect</p> <p><b>4. Thermodynamics:</b> states of matter, heat, calorimetric calculations, ideal gas law, thermodynamic processes, kinetic theory of gases, internal energy, work in thermodynamic processes, reversible and non reversible processes, thermodynamic cycles, Carnot's engine.</p> <p><b>5. Wave optics essentials:</b> Huygens principle, reflection and refraction of light, interference and diffraction of light.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	50.0%	50.0%
	Written test	50.0%	25.0%
	Written test	50.0%	25.0%
Recommended reading	Basic literature	C. Bobrowski, "Fizyka - krótki kurs"	
		D. Halliday, R. Resnick, J. Walker, "Podstawy fizyki"	
	Supplementary literature	R. Feynman, "Feynman Lectures on Physics"	
	eResources addresses	Adresy na platformie eNauczanie:	

<p>Example issues/ example questions/ tasks being completed</p>	<p>Explain basic concepts and quantities in kinematics - position, velocity, acceleration.</p> <p>Discuss three Newton's principles of dynamics.</p> <p>Explain the notion of gravitational potential energy.</p> <p>Discuss energy transfer (kinetic to potential and vice versa) during the motion of mathematical pendulum.</p> <p>What does the term "standing wave" stand for?</p> <p>Discuss two arbitrarily chosen thermodynamic processes.</p>
<p>Work placement</p>	<p>Not applicable</p>