



Subject card

Subject name and code	Physics, PG_00038086						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study		
Mode of study	Full-time studies	Mode of delivery			blended-learning		
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. Krzysztof Armiński dr hab. inż. Maciej Łuszczek					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 30.0						
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	60	28.0		87.0		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	Student is able to cooperate with the teacher and other students during the analysis of various physical problems aimed to find proper solution.			[SK2] Assessment of progress of work		
	[K6_U01] can obtain information from literature, databases and other sources; integrate the information obtained, interpret it and draw conclusions, formulate and justify opinions	Student is able to use various bibliographic resources and can make correct conclusions.			[SU1] Assessment of task fulfilment		
	[K6_W02] has basic knowledge of physics including electrostatics, electromagnetism, electrodynamics, wave motion, acoustics, mechanics, thermodynamics, optics, solid state physics; including knowledge necessary to understand the basic physical phenomena occurring in devices of systems and systems of automation and robotics	Student is able to recognize physical phenomena and connect them with correct relations what is necessary for solving real problems in various fields of technology if only specific mathematical formulas are used.			[SW1] Assessment of factual knowledge		

Subject contents	<p>1. Mechanics</p> <p>Kinematics: basic concepts and quantities, rectilinear motion with constant acceleration, relativity of motion, projectile motion, circular motion.</p> <p>Dynamics: Newton's principles, inertial and non inertial reference systems, translational motion dynamics, rotational motion dynamics</p> <p>Conservation laws in dynamics: conservation of energy, momentum and angular momentum</p> <p>2. Gravity: Newton's law of universal gravitation, gravitational potential energy, escape velocity</p> <p>3. Vibrations and waves.</p> <p>Simple harmonic motion: equation of motion. energy, mathematical pendulum, physical pendulum, superposition of harmonic motions</p> <p>Damped harmonic motion.</p> <p>Forced vibrations and resonance.</p> <p>Waves in elastic media: classification of waves, wave propagation, superposition of waves, standing waves.</p> <p>Sound waves: audible sounds, ultra- and infrasound, standing acoustic waves, beats, Doppler's effect</p> <p>4. Thermodynamics: 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>5. Wave optics essentials: Huygens principle, reflection and refraction of light, interference and diffraction of light.</p>														
Prerequisites and co-requisites															
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="448 1404 794 1435">Subject passing criteria</th> <th data-bbox="794 1404 1141 1435">Passing threshold</th> <th data-bbox="1141 1404 1487 1435">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 1442 794 1473">Exam</td> <td data-bbox="794 1442 1141 1473">50.0%</td> <td data-bbox="1141 1442 1487 1473">50.0%</td> </tr> <tr> <td data-bbox="448 1480 794 1512">Written test II</td> <td data-bbox="794 1480 1141 1512">50.0%</td> <td data-bbox="1141 1480 1487 1512">25.0%</td> </tr> <tr> <td data-bbox="448 1518 794 1541">Written test I</td> <td data-bbox="794 1518 1141 1541">50.0%</td> <td data-bbox="1141 1518 1487 1541">25.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Exam	50.0%	50.0%	Written test II	50.0%	25.0%	Written test I	50.0%	25.0%
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<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>