GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics, PG_00038427		
Field of study	Hydrogen Technologies and Electromobility		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
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	Partment of Metrology and Information Systems -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Maciej Łuszczek	
	Teachers	dr hab. inż. Maciej Łuszczek dr inż. Maria Chomka	

Lesson types

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_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	The student is able to use various bibliographic resources and he/ she can make correct conclusions.	[SU1] Assessment of task fulfilment
[K6_W02] has 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	The student acquires the ability to associate physical phenomena and appropriate relationships, which can be used to solve real problems in various fields of technology, provided that appropriate mathematical relationships are used.	[SW1] Assessment of factual knowledge

Subject contents	Course content – lecture **Lecture** **1. Kinematics and Dynamics** • Kinematics: basic concepts and kinematic quantities, uniform rectilinear motion and uniformly accelerated motion, curvilinear motion, relativity of motion, projectile motion, circular motion. • Dynamics: Newtons laws of motion, inertial and non-inertial reference frames, dynamics of translational motion, dynamics of rotational motion. • Conservation laws in mechanics: conservation of energy, conservation of linear momentum, conservation of angular momentum. **2. Gravitation** • Law of universal gravitation. • Gravitational potential energy. • Intensity and potential of the gravitational field. • Keplers laws. • Escape velocities. **3. Oscillations and Waves** • Simple harmonic motion: equation of motion, energy of oscillations, simple pendulum, physical pendulum, superposition of harmonic motions. • Damped harmonic motion: damping coefficient, logarithmic decrement. • Forced oscillations and resonance: amplitude of forced oscillations, resonance curves. • Waves in elastic media: types of waves, phase velocity, wavelength, wave reflection, composite waves, superposition principle, interference, standing waves, diffraction and refraction, dispersion, group velocity. • Sound waves: audible sounds, ultrasound and infrasound, Doppler effect. **4. Thermodynamics** • States of matter. • Heat, heat balance equation. • Ideal gas equation of state, gas transformations, kinetic theory of an ideal gas. • Laws of thermodynamics. • Internal energy. • Work in gas processes. • Reversible and irreversible processes. • Thermodynamic cycles, Carnot engine. **Problem-Solving Classes** **1. Kinematics** Uniform rectilinear motion, uniformly accelerated rectilinear motion, variable motion, curvilinear motion, projectile motion, circular motion. **2. Dynamics** Newtons laws of motion, inclined plane, conservation of momentum, inertial forces, mechanical work, power, mechanical energy, rotational motion of a rigid body, torque, moment of inertia, conservation of angular momentum. **3. Gravitational Field** Law of universal gravitation, intensity and potential of the gravitational field, satellite motion in a gravitational field. **4. Oscillations and Waves** Harmonic motion, simple pendulum, sound. **5. Thermodynamics** Heat balance, equation of state for gases, gas transformations.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Written test	50.0%	25.0%
Written test	50.0%	25.0%
Exam	50.0%	50.0%

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

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