



Subject card

Subject name and code	Physics, PG_00054677						
Field of study	Biotechnology						
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		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Division of Complex Systems Spectroscopy -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Tomasz Wąsowicz				
	Teachers		dr inż. Tymon Kilich dr hab. Tomasz Wąsowicz dr inż. Agnieszka Haryńska				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	0.0	45
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 8561 FIZYKA BT sem. zim. 2026/2027 https://enauzanie.pg.edu.pl/2025/course/view.php?id=8561						
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		6.0		49.0	100
Subject objectives	A student -correctly writes and reads the physical formulas, -knows principles of vector algebra, -understands the basic laws of physics, -predicts the course of physical phenomena on the basis of known laws, -solves physical problems encountered in mechanics and electromagnetism, -can carry out logical reasoning appropriate to the physical problem being solved, -can actively use the acquired knowledge to solve various technical problems.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U01		learns by himself, can prepare experiments, has an ability to verify facts and to draw the conclusions		[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
	K6_W01		has knowledge to: -correctly write and read physical formulae, -distinguish scalar and vector quantities, -understand fundamental physical laws, -predict the following course of actions according to the physical laws, -set up and solves physics problems in mechanics and electromagnetism.		[SW1] Assessment of factual knowledge		

Subject contents	Course content – lecture		
	ABOUT PHYSICS. Physical quantities and their units . Elements of vector algebra . MECHANICS . Kinematics of a particle : rectilinear motion , curvilinear 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. Coneservation laws in mechanics . Oscillations and mechanical waves . Free, damped and forced vibrations. Mechanical resonance . Beats . Distribution of periodic oscillations in the harmonic components . Types of waves. Equation of harmonic plane wave motion . Wave velocity . Examples of diffraction and interference of waves. Standing waves . Doppler effect. Sound intensity level . ELECTROMAGNETISM. 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 . Magnetic field. Magnetic induction vector . The Lorentz force . Biot- Savart law . Electrodynamic force . The interaction of two straight linear wires carrying an electric current. Magnetic dipole and its behavior in an external magnetic field.		
	Course content – exercises		
	1. Multiples and submultiples of physical quantities. 2. Vector algebra: scalar product and vector product. 3. Kinematics: motion with constant acceleration (vertical, horizontal, oblique projection). 4. Dynamics of translational motion: the block slides down an inclined plane. 5. Moments of inertia of molecules. 6. Dynamics of rotational motion: weights suspended on a rope thrown over a pulley. 7. Principle of conservation of angular momentum: a person with dumbbells on a turntable. 8. Rolling of a body without slippage: a solid cylinder rolls down an inclined plane. 9. Oscillatory motion: mathematical and physical pendulum, weight attached to a spring. 10. Doppler effect. 11. Standing waves in pipes and strings. 12. Coulomb's law. Electric field strength on dipole axes. 13. Dipole moments of molecules. 14. Lorentz force: the motion of a charged particle in a magnetic field.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	2 tests during semester	50.0%	100.0%
Recommended reading	Basic literature	D. Halliday, R. Resnick, J .Walker, Fundamentals of Physics, 8th Edition, Wiley 2008.	
	Supplementary literature	Paul.G. Hewitt, Conceptual physics, 12nd edition, Pearson 2015	
	eResources addresses		
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. Man in a spinning chair .		
	3 Examples of harmonic oscillators : pendulum , the weight attached to a spring		
	4 Damped motion. Over time t1 amplitude of vibrations decreased n1 times. How many times will decrease the amplitude of vibrations in the time t2 ?		
	5 Doppler effect . Doppler ultrasound machine.		
	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. Determination of the dipole moments of molecules		
	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. Mass spectrometer.		
	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.		
Practical activites within the subject	Not applicable		

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