



Subject card

Subject name and code	Physics_I, PG_00059253						
Field of study	Civil Engineering						
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	Part-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			8.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Division Of Complex Systems Spectroscopy -> Institute Of Physics And Applied Computer Science -> Faculty Of Applied Physics And Mathematics -> Wydział Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Marcin Dampc				
	Teachers		dr inż. Marcin Dampc				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	25.0	20.0	10.0	0.0	0.0	55
	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	55	10.0		135.0	200	
Subject objectives	<p>1. Deeper understanding of the laws of classical physics.</p> <p>2. Acquaintance with the laws of modern physics which are the base of modern technology.</p> <p>3. Put up the physical problems and resolved them, in relation to future engineering problems.</p> <p>4. Create practices in the use of physical devices, taking measurements and study the results.</p>						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U01] Apply knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering to solve engineering problems and issues.		Can solve problems concerning kinematics, dynamics, oscillations and wave mechanics.		[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	[K6_W01] Demonstrate knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering at a level necessary to achieve the other programme outcomes.		Possess knowledge on mechanics, optics, hydrostatics, atomic physics and related matter properties.		[SW1] Assessment of factual knowledge		

Subject contents	<p>LECTURES Methodology of physics. Physical quantities and their units. MECHANICS. Kinematics of a translation and rotation motions. Newtons laws. Dynamics of a rigid body: the rotational motion around a fixed axis, moment of inertia, principal axes, Steiner (parallel axis) theorem, torque and angular momentum, Newtons equation of rotational motion, precession and gyroscopes. The conservation laws in mechanics. Fluids statics: Pascal and Stokes laws. Fluids dynamics. Bernoulli equation. Flow of real liquids. Stokes law. Reynolds number. Mechanical oscillations and waves. Free, damped and driven oscillations. Mechanical resonance. Beats. Decomposition of periodical oscillations into harmonic components. Kinds of waves. Kinematical equation of a plane harmonic wave. Wave velocity. Diffraction and interference examples. Standing waves. Doppler effect. Ultrasounds. OPTICS. Spectrum of electromagnetic waves. Geometrical optics: the laws of light reflection and refraction, prism. Wave optics: polarization, diffraction and interference, diffraction grating. Spectral analysis of light, optical spectrometer. Quantum properties of radiation: thermal radiation, photoelectric effect, photons. ATOMIC PHYSICS. Bohr model of the hydrogen atom. X-rays. Lasers: stimulated emission, laser action, kinds of lasers, applications. Holography. De Broglie waves. Heisenberg uncertainty principle. TUTORIALS 1. Kinematics quantities. Motion with a constant acceleration. 2. Newtons laws. Force and torque. 3. Moment of inertia. 4. Work, kinetic and potential energy, the conservation law of mechanical energy. 5. Conservation law of angular momentum. 6. Simple and damped harmonic oscillators. 7. Characteristics of waves. Standing waves. 8. Properties of light. 9. Diffraction grating. 10. Thermal radiation. 11. Photoelectric effect. 12. Bohr's model of hydrogen atom. LABORATORY (student performs 3 experiments from the following list) 1. Determination of the acceleration due to gravity using a simple pendulum. 2. Determination of moments of inertia. 3. Determination of a moment of inertia ellipsoid. 4. Determination of the density of liquids. 5. Measurement of the sound velocity in air using a resonance method and superposition of perpendicular oscillations. 6. Determination of the velocity of longitudinal sound waves in rods. 7. Determination of the linear expansion coefficient of solids. 8. Measurement of the resistance using a Wheatstone's bridge. 9. Determination of the horizontal component of the Earth's magnetic field. 10. Measurement of the lens focal length by the Bessel's method. 11. Measurement of the magnification of microscope and telescope. 12. Measurement of the radius of curvature of a lens by the method of Newton's rings. 13. Determination of size of gaps and obstacles using laser light. 14. Measurement of the light source intensity by using the Lummer-Brodhun photometer. 15. Determination of refractive index of light using de Chaulnes's method and the Brewster's law. 16. Measurement of refractive index dependence on light wavelength for a quartz glass. 17. Investigation of the non-equilibrium emission spectra of gases.</p>														
Prerequisites and co-requisites	Elementary physics from the secondary school														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="454 891 788 920">Subject passing criteria</th> <th data-bbox="799 891 1139 920">Passing threshold</th> <th data-bbox="1150 891 1482 920">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="454 927 788 956">Laboratory</td> <td data-bbox="799 927 1139 956">60.0%</td> <td data-bbox="1150 927 1482 956">20.0%</td> </tr> <tr> <td data-bbox="454 963 788 992">Written exam</td> <td data-bbox="799 963 1139 992">50.0%</td> <td data-bbox="1150 963 1482 992">50.0%</td> </tr> <tr> <td data-bbox="454 999 788 1028">Midterm colloquium</td> <td data-bbox="799 999 1139 1028">50.0%</td> <td data-bbox="1150 999 1482 1028">30.0%</td> </tr> </tbody> </table>	Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory	60.0%	20.0%	Written exam	50.0%	50.0%	Midterm colloquium	50.0%	30.0%		
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<p>Example issues/ example questions/ tasks being completed</p>	<p>I. A body at rest in a system is capable of doing work if:</p> <p>A. the potential energy of the system is positive</p> <p>B. the potential energy of the system is negative</p> <p>C. it is free to move in such a way as to decrease its kinetic energy</p> <p>D. it is free to move in such a way as to decrease the potential energy of the system</p> <p>E. it is free to move in such a way as to increase the potential energy of the system</p> <p>II. Two wires made of different materials have the same uniform current density. They carry the same current only if:</p> <p>A. their lengths are the same</p> <p>B. their cross-sectional areas are the same</p> <p>C. both their lengths and cross-sectional areas are the same</p> <p>D. the potential differences across them are the same</p> <p>E. the electric fields in them are the same</p> <p>III. In the formula $\vec{F} = q\vec{v} \times \vec{B}$:</p> <p>A. \vec{F} must be perpendicular to \vec{v} but not necessarily to \vec{B}</p> <p>B. \vec{F} must be perpendicular to \vec{B} but not necessarily to \vec{v}</p> <p>C. \vec{v} must be perpendicular to \vec{B} but not necessarily to \vec{F}</p> <p>D. all three vectors must be mutually perpendicular</p> <p>E. \vec{F} must be perpendicular to both \vec{v} and \vec{B}</p>
<p>Work placement</p>	<p>Not applicable</p>

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