



Subject card

Subject name and code	Physics, PG_00058987						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
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			9.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Zakład Spektroskopii Układów Złożonych -> Instytut Fizyki i Informatyki Stosowanej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Dampc					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	25.0	35.0	0.0	0.0	0.0	60
	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	60	8.0		157.0		225
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] has the ability to self-education, can obtain information from literature, databases and other sources, uses information technology, Internet resources; can integrate the obtained information, make their interpretation, as well as draw conclusions and formulate and justify opinions	Is capable of solving physics problems and discussing obtained results.			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	[K6_W02] has knowledge of physics, including mechanics, thermodynamics, optics, electricity and magnetism, nuclear physics and solid state physics, including knowledge necessary to: 1) understand the basic physical phenomena related to material durability, fluid mechanics and hydraulics, building physics, geodetic measurements ; 2) understanding the principles of operation of basic electrical devices and systems; 3) solving project tasks of the sanitary industry;	Possess knowledge on mentioned fields of physics. and is capable of solving physics problems.			[SW1] Assessment of factual knowledge		

Subject contents	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.											
Prerequisites and co-requisites	Elementary physics from the secondary school											
Assessment methods and criteria	<table border="1" data-bbox="451 573 1487 678"> <thead> <tr> <th data-bbox="451 573 794 611">Subject passing criteria</th> <th data-bbox="794 573 1137 611">Passing threshold</th> <th data-bbox="1137 573 1487 611">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 611 794 645">Written exam</td> <td data-bbox="794 611 1137 645">50.0%</td> <td data-bbox="1137 611 1487 645">60.0%</td> </tr> <tr> <td data-bbox="451 645 794 678">Midterm colloquium</td> <td data-bbox="794 645 1137 678">50.0%</td> <td data-bbox="1137 645 1487 678">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Written exam	50.0%	60.0%	Midterm colloquium	50.0%	40.0%
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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>