GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00058178		
Field of study	Green Technologies		
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	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	English
Semester of study	1	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Physics of Electronic Phenomena -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jędrzej Szmytkowski	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	30.0	0.0	0.0	0.0	45

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	45	10.0	80.0	135

Subject objectives

The aim is to demonstrate laws of physics

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K02] is aware of the social role of a technical college graduate, take the reflections on the ethical, scientific and social aspects of the work performed, understands the need to promote, formulating and providing the public with information and opinions concerning the activities of the profession of engineer.	Student is prepared to work as engineer	[SK5] Assessment of ability to solve problems that arise in practice
[K6_W01] has a basic knowledge from some branches of mathematics and physics useful for formulating and solving simple problems in the field of environmental technologies and modern analytical methods	Student knows elements of physics and can solve technological problems	[SW1] Assessment of factual knowledge
[K6_U05] can formulate and solve engineering tasks analytical methods, simulation as well as experimental, able to apply knowledge of basic physics and mathematics to analyze the results of experiments, is able to analyze and assess existing technical solutions	Student is able to apply laws of physics	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents	Lecture and Tutorials: About physics. Physical quantities and their units. Elements of vector algebra. Kinematics of a particle: linear motion, cirular 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. Consevation laws in mechanics. Pressure in a Liquid at Rest. Pascal's Principle and Archimedes' Principle. Bernoulli's Law. Oscillations and mechanical waves. Simple, damped and driven vibrations. Mechanical resonance. Beats. Types of waves. The equation of motion for harmonic plane waves. Wave velocity. Examples of diffraction and interference of waves. Standing waves. Doppler effect. Sound intensity level. Temperature and Heat. Laws of Thermodynamics. 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. Comparison of basic characteristics of the electric field and gravity. 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. Laboratory: 1. Determination of Young's modulus by the resonance method 2. Determination of the acceleration due to gravity using a simple pendulum 3. Determination of the moment of inertia of a solid 4. Determination of the coefficient of rigidity of a wire 5. Measurement of the velocity of a sound in air 6. An investigation of the pressure dependence of the boiling point of water 7. Determination of the specific latent heat of vaporization of water 8. Determination of ratio of the specific heats c_p/c_v of air 9. Measurement of the electrochemical equivalent of copper and the Faraday constant 10. Measurement of capacitance using an alternating current bridge 11. An investigation of an alternating current circuit RLC 12. Determination of the horizontal component of the Earth's magnetic field 13. Determination of the characteristic curves of the diode valve 14. Measurement of the absorption coefficient for γ-rays 15. Determination of the refractive index of glass 16. Determination of the wavelength dependence of the refractive index of a glass prism 17. Measurement of the radius of curvature of a lens by the method of Newton's ring 18. Determination of the Rydberg constant
Prerequisites and co-requisites	Mathematics and physics from lyceum

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Tutorials: Writen tests</td><td>50.0%</td><td>30.0%</td></tr>
<tr><td>Lecture: Written exam</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Laboratory: Reports and tests</td><td>100.0%</td><td>20.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. H. Sodolski, Selected problems in physics with examples and exercises, Gdansk University of Technology Publishers 2007

2. D. Halliday, R. Resnick, J. Walker, Fundametals of physics, Wiley 2008</td></tr>
<tr><td>Supplementary literature</td><td>1. J. Orear, Physics, Macmillan Publishing Co, 1979

2. S.P. Myasnikov, T.N Osanova, Selected Problems in Physics, Mir Publishers 1990</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1. Moment of inertia . Determination of the moments of inertia of molecules
2. The principle of conservation of angular momentum.
3. Examples of harmonic oscillators : simple and physical pendulum, the weight attached to a spring
4. Damped motion. During time t1 the amplitude of vibrations decreased n1 times. How many times will decrease the
amplitude of vibrations in the time t2 ?
5. Doppler effect.
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.
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.
12. Motion of charge in electric field (mv2 / 2 = eU) . Definition of electronvolt
13. Capacitor and coil. Capacitance and inductance. Definition of farad and henry.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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