GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics, PG_00060842		
Field of study	Chemical Technology		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
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	2	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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Waldemar Stampor	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	15.0	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	5.0	85.0	150

Subject objectives

The main objective of the course is:

acquire a certain amount of knowledge of general physics,

teach thinking in terms of cause-and-effect relationships and to understand the limitations imposed by the fundamental laws of physics,

acquire problem-solving skills encountered in engineering work.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W01] Possesses knowledge of mathematics and physics necessary to analyze and describe technological processes, including differential and integral calculus, numerical methods, statistics and elements of vector analysis.	The student has the ability to write and read physical formulas, understand the basic physical laws, correctly apply the acquired knowledge in the field of electromagnetism, optics, nuclear and solid state physics to solve various technical problems	[SW1] Assessment of factual knowledge
[K6_U01] Is able to independently plan the learning process and acquire, analyse and interpret information from various sources, also in English.	The student is able to critically analyze information obtained from textbooks, the Internet and other sources.	[SU2] Assessment of ability to analyse information

Subject contents

Electrodynamics . Electromagnetic induction . Faraday's law of mutual induction and self-induction, inductance of an electric circuit . Maxwell's equations for a vacuum. Electromagnetic oscillations in an LC circuit . OPTICS . The spectrum of electromagnetic waves. Geometric optics : the law of reflection and refraction of light , prism . Wave optics : polarization , diffraction and interference of waves , diffraction grating . The spectral analysis of light, optical spectrometer . Quantum optics : thermal radiation , photoelectric effect, properties of photons. ATOMIC PHYSICS. Bohr's model of the hydrogen atom. Vector model of the atom and quantum numbers , spin-orbit coupling and fine structure of spectral lines , the Zeeman effect , electron magnetic resonance . X-rays. Lasers: stimulated emission , lasing conditions , types of lasers , applications. Waves of de Broglie and electron microscope . The Schrödinger equation : the wave function, tunneling. Tunneling microscope.

Prerequisites and co-requisites

<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>Lab</td><td>50.0%</td><td>25.0%</td></tr>
<tr><td>Tutorials</td><td>50.0%</td><td>25.0%</td></tr>
<tr><td>Written exam</td><td>50.0%</td><td>25.0%</td></tr>
<tr><td>Oral exam</td><td>50.0%</td><td>25.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. D.Halliday, R.Resnick, J.Walker. Podstawy fizyki. T.1 - T.5; PWN, Warszawa 2003.

2. Cz. Bobrowski. Fizyka. Krótki kurs. WNT, Warszawa 2004.

3. Atomy i kwanty, H.Haken, H.C.Wolf, PWN, Warszawa 1997.</td></tr>
<tr><td>Supplementary literature</td><td>1. J.Orear. Fizyka T1 i T2. WNT, Warszawa 2008.

2. J.Massalski. Fizyka dla inżynierów. T.1i T.2; WNT, Warszawa 2007.

3. V.Acosta, C.L.Cowan, B.J.Graham. Podstawy fizyki współczesnej, PWN, Warszawa 1981.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1 Passage of light through a prism and a diffraction grating. Optical spectrometer
2 Thermal radiation. Wien's displacement law and Stefan-Boltzmann law. The weight loss by radiation from the Sun
3 Einstein's equation for the photoelectric effect. What is potential of the copper ball (W = 4.5eV) illuminated by UV radiation with a wavelength of 250nm?
4 Bohr's model of the atom of hydrogen. Bohr orbits. Rydberg formula. Bohr magneton. Calculate the wavelength of the red line of the Balmer series
5 Quantum numbers. Orbital, spin and total angular momentum. Spatial quantization of angular moments
6 Spin-orbit coupling. Fine structure (double) yellow line of sodium
7. Zeeman effect. The red line of cadmium in the magnetic field 8 Precession of a magnetic dipole in the magnetic field. Electron and nuclear magnetic resonance
9 Waves of matter (de Broglie). Wavelength of speeding electron. The electron microscope
10 The wave function and the probability density. The Schrodinger equation11 Tunneling and tunneling microscope</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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