GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics, PG_00037371		
Field of study	Chemistry		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2023/2024
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	6.0
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. Waldemar Stampor	
	Teachers	dr hab. inż. Waldemar Stampor dr inż. Ireneusz Linert dr Maciej Kuna dr Piotr Weber	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	30.0	0.0	0.0	75
	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	75	5.0	70.0	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_U02] can work individually and in a team; he/she can assess the necessary task time and plan and organize individual work and in a small team in a way that ensures the execution of the task within a set deadline	Able to collaborate and work effectively in a team	[SU1] Assessment of task fulfilment
[K6_U04] can use professional vocabulary, can prepare and communicate technical information in the form of text documents, spreadsheets, charts and technological schema	Knows professional terms within the scope of general physics, able to do a report containing graphs and tables of laboratory exercises	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
[K6_U08] is capable to design and carry out the experiment which is necessary to confirm a given hypothesis and sees wider context, often beyond-technical, of the analysed phenomena	can design and conduct the experiment necessary to confirm the hypothesis, sees a wider, often non-technical, context of the analyzed physical phenomena	[SU3] Assessment of ability to use knowledge gained from the subject
[K6_W01] has basic knowledge of selected areas of mathematics, including: algebra, differential calculus and integral calculus, functions of two variables, elements of analytical geometry, elements of vector analysis, differential equations and probability theory, and knowledge of physics: basic equations and concepts and physical laws, including the knowledge necessary to predict the course of physical phenomena and to solve various technical problems	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

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. Lasers. X-rays. BASIC QUANTUM MECHANICS. Waves of de Broglie and electron microscope. The Schrödinger equation: the wave function, tunneling. Tunneling microsope.

Prerequisites and co-requisites

Physics semester I

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory	50.0%	25.0%
Tutorial	50.0%	25.0%
Written exam	50.0%	25.0%
Oral exam	50.0%	25.0%

Recommended reading

Basic literature	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.
Supplementary literature	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.
eResources addresses	Adresy na platformie eNauczanie: Fizyka dla chemików 2023/2024 sem 2 - Moodle ID: 31493 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=31493

Example issues/ example questions/ tasks being completed	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. 9. Electron and nuclear magnetic resonance 10. Waves of matter (de Broglie). Wavelength of the speeding electron. The electron microscope 11. The wave function and the probability density. The Schrodinger equation 12. Tunneling and tunneling microscope
Work placement	Not applicable