



Subject card

Subject name and code	Physics, PG_00060842						
Field of study	Chemical Technology						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2026/2027		
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 -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Waldemar Stampor				
	Teachers		Agnieszka Haryńska dr inż. Damian Głowienka mgr inż. Tymon Kilich dr inż. Daniel Pelczarski Maria Lachowicz dr hab. inż. Waldemar Stampor				
Lesson types	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						
	eNauczanie source address: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=48088						
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 (electrodynamic, optics, atomic and nuclear 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.		has the knowledge necessary to correctly 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.		is able to critically analyze information obtained from textbooks, the Internet and other sources.		[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment		

Subject contents	Course content – lecture		
	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.		
	Course content – exercises		
	1. Lorentz force 2. Electrodynamical force 3. Magnetic dipole in an external magnetic field 4. Light 5. Diffraction grating 6. Thermal radiation 7. Photoelectric effect 8. Bohr model of the hydrogen atom 9. Vector model of the atom 10. Zeeman effect 11. Magnetic resonance 12. De Broglie waves		
	Course content – laboratory		
	1. Determining the acceleration due to gravity using a simple pendulum.		
	2. Determining the moment of inertia.		
	3. Measuring resistance with a Wheatstone bridge.		
	4. Determining the horizontal component of the Earth's magnetic field.		
	5. Magnetic dipole in an external magnetic field.		
	6. Determining the radius of curvature of a lens using Newton's rings.		
	7. Examining the radiation spectrum of a hydrogen lamp using a diffraction grating.		
	8. Determining the refractive index.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lectures written exam	50.0%	25.0%
	Lectures: oral exam	50.0%	25.0%
	Tutorials: two mid-term tests	50.0%	25.0%
	Laboratory: completed 4 lab exercises	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	
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 ($W = 4.5\text{eV}$) 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 equation 11 Tunneling and tunneling microscope	
Practical activities within the subject	Not applicable	

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