GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	PHYSICS, PG_00064377		
Field of study	Chemistry		
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	6.0
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. Daniel Pelczarski mgr inż. Bartosz Majewski dr hab. inż. Waldemar Stampor	

Lesson types	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						
	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	75	5.0	70.0	150

Subject objectives	The main objective of the course is acquire a certain amount of knowledge of general physics (electrodynamics, 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] applies his/her knowledge of selected branches of mathematics and physics to analyse, interpret and solve problems and to describe physical, chemical phenomena and technological processes	has the necessary knowledge to write and interpret physical formulas and to understand basic laws of physics; 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_U04] creates detailed documentation of the results obtained from the experiments carried out individually or as part of a team, analysing and interpreting the results in the form of text documents, spreadsheets, graphs, technological diagrams, multimedia presentations using correct chemical nomenclature	is able to critically analyze information obtained from textbooks, the Internet and other sources and is able to prepare a report containing charts and tables from laboratory exercises	[SU4] Assessment of ability to use methods and tools
	[K6_U02] determines the time required for the task, plans and organises the work of both the individual and the small team in such a way as to ensure that the task is completed within the set time limit	is able to complete a report on laboratory exercises on time, using technical terms in the field of general physics.	[SU1] Assessment of task fulfilment
	[K6_K03] is aware of the importance of caring for the quality and diligence of the tasks performed, being responsible for their consequences	is aware of the importance of correctly and carefully analyzing the course of fundamental physical phenomena based on calculations and laboratory experiments, observing the principles of safety and good laboratory practice.	[SK5] Assessment of ability to solve problems that arise in practice

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

Course content – exercises

1. Lorentz force
2. Electrodynamic 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%
Laboratory: completed 8 lab exercises	50.0%	25.0%
Tutorials: two written mid-term tests	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 = 4.5eV) 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	
Practical activites within the subject	Not applicable	

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