GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics, PG_00057671		
Field of study	Green Technologies		
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 hab. inż. Waldemar Stampor dr inż. Ewa Erdmann	

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	10.0	80.0	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_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	knows how to interpret results of his research	[SU2] Assessment of ability to analyse information
[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.	is prepared to learn physics during his life	[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	has the knowledge necessary to correctly write and read physical formulas, understands the basic laws of physics, has knowledge of physics, including electromagnetism, optics and atomic physics, nuclear physics elements and solid state physics, applies the learned knowledge to various technical problems	[SW1] Assessment of factual knowledge

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 1
0. 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: 2 written midterm 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, Fundametals of physics, Wiley 2008 2. H.Haken, H.C.Wolf, Atomic and quantum physics, Springer 1987.
Supplementary literature	1. J. Orear, Physics, Macmillan Publishing Co, 1979
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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