GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics_I, PG_00059253		
Field of study	Civil Engineering		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	8.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Division of Complex Systems Spectroscopy -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Dampc	
	Teachers	dr inż. Marcin Dampc	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	25.0	20.0	10.0	0.0	0.0	55
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	55	10.0	135.0	200

Subject objectives

1. Deeper understanding of the laws of classical physics.

2. Acquaintance with the laws of modern physics which are the base of modern technology.

3. Put up the physical problems and resolwed them, in relation to future engineering problems.

4. Create practices in the use of physical devices, taking measurements and study the results.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U01] Apply knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering to solve engineering problems and issues.	Can solve problems concerning kinematics, dynamics, oscillations and wave mechanics.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K6_W01] Demonstrate knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering at a level necessary to achieve the other programme outcomes.	Possess knowledge on machanics, optics, hydrostatics, atomic physics and related matter properties.	[SW1] Assessment of factual knowledge

Subject contents	LECTURES Methodology of physics. Physical quantities and their units. MECHANICS. Kinematics of a translation and rotation motions. Newtons laws. Dynamics of a rigid body: the rotational motion around a fixed axis, moment of inertia, principal axes, Steiner (parallel axis) theorem, torque and angular momentum, Newtons equation of rotational motion, precession and gyroscopes. The conservation laws in mechanics. Fluids statics: Pascal and Stokes laws. Fluids dynamics. Bernoulli equation. Flow of real liquids. Stokes law. Reynolds number. Mechanical oscillations and waves. Free, damped and driven oscillations. Mechanical resonance. Beats. Decomposition of periodical oscillations into harmonic components. Kinds of waves. Kinematical equation of a plane harmonic wave. Wave velocity. Diffraction and interference examples. Standing waves. Doppler effect.Ultrasounds. OPTICS. Spectrum of electromagnetic waves. Geometrical optics: the laws of light reflection and refraction, prism. Wave optics: polarization, diffraction and interference, diffraction grating. Spectral analysis of light, optical spectrometer. Quantum properties of radiation: thermal radiation, photoelectric effect, photons. ATOMIC PHYSICS. Bohr model of the hydrogen atom. X-rays. Lasers: stimulated emission, laser action, kinds of lasers, applications. Hologrphy.De Broglie waves. Heisenberg uncertainty principle. TUTORIALS 1. Kinematics quantities. Motion with a constant acceleration. 2. Newtons laws. Force and torque. 3. Moment of inertia. 4. Work, kinetic and potential energy, the conservation law of mechanical energy. 5. Conservation law of angular momentum. 6. Simple and damped harmonic oscillators. 7. Characteristics of waves. Standing waves. 8.Priperties of light. 9. Diffraction grating. 10. Thermal radiation. 11. Photoelectric effect. 12. Bohr"s model of hydrogen atom. LABORATORY (student performs 3 experiments from the following list) 1. Determination of the acceleration due to gravity using a simple pendulum. 2. Determination of moments of inertia. 3. Determination of a moment of inertia ellipsoid. 4. Determination of the density of liquids. 5. Measurement of the sound velocity in air using a resonance method and superposition of perpendicular oscillations. 6. Determination of the velocity of longitudinal sound waves in rods. 7. Determination of the linear expansion coefficient of solids. 8.Measurement of the resistance using a Wheatstone"s bridge. 9.Determination of the horizontal component of the Earth"s magnetic field. 10.Measurement of the lens focal length by the Bessel"s method. 11.Measurement of the magnification of microscope and telescope. 12.Measurement of the radius of curvature of a lens by the the method of Newton"s rings. 13.Determination of size of gaps and obstacles using laser light. 14.Measurement of the light source intensity by using the Lummer-Brodhun photometer. 15.Determination of refractive index of light using de Chaulnes"s method and the Brewster"s law. 16.Measurement of refractive index dependence on light wavelength for a quartz glass. 17.Investigation of the non-equilibrium emission spectra of gases.
Prerequisites and co-requisites	Elementary physics from the secondary school
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory	60.0%	20.0%
Written exam	50.0%	50.0%
Midterm colloquium	50.0%	30.0%

Recommended reading	Basic literature	1.Marta Skorko, FIZYKA, W-wa ,PWN. (dowolne wydanie). 2. Czesław Bobrowski, FIZYKA krótki kurs, W-wa, WNT.(dowolne wydanie).
	Supplementary literature	1.Jerzy Masalski, FIZYKA dla inżynierów. część I, W-wa, WNT. (dowolne wydanie).
	eResources addresses	Adresy na platformie eNauczanie: Fizyka WILIŚ Niestacjonarne (2024/2025) - Moodle ID: 34041 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34041

Example issues/ example questions/ tasks being completed	I. A body at rest in a system is capable of doing work if: A. the potential energy of the system is positive B. the potential energy of the system is negative C. it is free to move in such a way as to decrease its kinetic energy D. it is free to move in such a way as to decrease the potential energy of the system E. it is free to move in such a way as to increase the potential energy of the system II. Two wires made of diferent materials have the same uniform current density. They carry the same current only if: A. their lengths are the same B. their cross-sectional areas are the same C. both their lengths and cross-sectional areas are the same D. the potential diferences across them are the same E. the electric ¯elds in them are the same III. In the formula $F = qv \times B$: A. F must be perpendicular to ~v but not necessarily to ~B B.F must be perpendicular to ~B but not necessarily to ~v C. v must be perpendicular to ~B but not necessarily to ~F D. all three vectors must be mutually perpendicular E. F must be perpendicular to both ~v and ~B
Work placement	Not applicable

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