GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modern Physics, PG_00047661		
Field of study	Informatics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Katedra Fizyki Atomowej, Molekularnej i Optycznej -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Sebastian Bielski	
	Teachers	dr inż. Sebastian Bielski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

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	30	3.0	42.0	75

Subject objectives

The aim of the subject is to provide students with the basic knowledge of physics helpful in further education.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U12] is able, to an advanced degree, to analyze the operation of components and systems related to the field of study, and to measure their parameters and study their technical characteristics, as well as to plan and carry out experiments related to the field of study, including measurements and computer simulations, and to interpret the obtained results and draw conclusions	Ability to prepare and perform simple measurements of physical quantities and to prepare reports, including error analysis.	[SU1] Assessment of task fulfilment
[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	Student lists and explains the basic physical phenomena, concepts, dependencies and laws concerning electromagnetism, theory of relativity and basics of quantum mechanics. Student solves simple problems of quantum mechanics and electromagnetics.	[SW1] Assessment of factual knowledge
[K6_U02] can perform tasks related to the field of study in an innovative way as well as solve complex and nontypical problems, applying knowledge of physics, in changing and not fully predictable conditions	Student solves simple problems of quantum mechanics and simple problems concerning electricity and magnetism.	[SU1] Assessment of task fulfilment

Subject contents	Lecture Electromagnetism. Electric field E. Eletric potential. Gauss' law for electric field. Electric dipole. Lorentz force. Magnetic field B. Magnetic field of a moving charge. Biot-Savart law. Magnetic field of a straight wire. Magnetic force on a current carrying wire. Ampere's law. Interaction of two parallel long wires. Faraday's law. Maxwell's equations. Einstein's postulates. Lorentz transformation and its consequences. Polarization of light. Black body radiation. Photoelectric effect. Compton efect. Bohr model. Wave-particle duality. De Broglie hypothesis. Heisenberg uncertainty relations. Schrodinger's wave equation - examples of solutions (quantum well). Emission and absorption of light. Stimulated emission. Laser operation principle. Laboratory Perfoming a few experiments; conclusions, error analysis
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
laboratory: oral answers, reports	50.0%	33.0%
Lecture: final test	50.0%	67.0%

Recommended reading	Basic literature	1. Halliday D., Resnick R., Walker J., Fundamentals of physics 2. Openstax, University physics https://ftims.pg.edu.pl/strona-glowna/wydzial/laboratoria-wydzialowe/i-pracownia-fizyczna
	Supplementary literature	1. Sidney B. Cahn, Boris E. Nadgorny, and Paul D. Scholten, A Guide To Physics Problems. 2. Jackson J. D., Classical Electrodynamics 3. Griffiths D. J., Introduction to Electrodynamics
	eResources addresses	Adresy na platformie eNauczanie: Fizyka współczesna 25/26 - Moodle ID: 42650 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=42650
Example issues/ example questions/ tasks being completed	How does the maximum possible kinetic energy of electrons Ek depend on the incident light intensity I? We assume that the energy of each photon is greater than the work function. A) Ek does not depend on I B) Ek increases linearly with I C) Ek decreases linearly with I D) more information is needed According to the Gauss' law the electric flux through any closed surface S A) is always equal to zero B) depends only on the electric charges inside S C) depends only on the electric charges outside S D) depends on both the electric charges inside and outside S The inductance of a solenoid depends on (choose the right answer) A) cross-sectional area of the wire (or the diameter of the wire) and the length of the solenoid B) the length of the solenoid and the cross-sectional area of the solenoid C) the cross-sectional area of the solenoid and the current D) the current and the cross-sectional area of the wire Experiment: determine the moment of inertia of a given object.	
Work placement	Not applicable	

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