GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modern Physics, PG_00047661		
Field of study	Informatics		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2023/2024
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	Department of Atomic, Molecular and Optical Physics -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Sebastian Bielski	
	Teachers	dr inż. Ewa Erdmann dr Piotr Weber mgr inż. Michał Piłat Mateusz Poniatowski mgr inż. Natalia Tańska dr inż. Bartosz Reichel dr inż. Patryk Jasik dr inż. Ireneusz Linert 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_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
[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	Ability to perform simple measurements of physical quantities and to prepare reports, including error analysis.	[SU4] Assessment of ability to use methods and tools [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 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

Subject contents

Lecture
Electromagnetism. The vector electric field property. Magnetic field in vacuum. Electric and magnetic field of moving charge. Biot-Savart law. Magnetic field around a long wire. Lorentz force. Magnetic force on a current carrying wire. Ampere's laws. Interaction of two parallel long wires. Faraday's law. Maxwell's equations. Einstein's postulates. Lorentz transformation and its consequences. The polarization of light. Black body radiation. Photoelectric phenomenon. Compton efect. Bohr model. Wave-particle duality. De Broglie's hypothesis. The Heisenberg uncertainty relations. Schrodinger's wave equation - examples of solutions. Hydrogen atom and hydrogen-like ion. Spin of an electron. 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
Knowledge of the lecture material (test)	50.0%	67.0%
laboratory: oral answers, reports	50.0%	33.0%

Recommended reading

Basic literature	1. Halliday D., Resnick R., Walker J., Fundamentals of physics 2. Openstax, University physics 3. Griffiths D. J. , Introduction to Electrodynamics https://ftims.pg.edu.pl/experiments-in-physics
Supplementary literature	1. Sidney B. Cahn, Boris E. Nadgorny, and Paul D. Scholten, A Guide To Physics Problems. 2. Jackson J. D., Classical Electrodynamics
eResources addresses	Adresy na platformie eNauczanie:

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