

GDAŃSK UNIVERSITY

Subject card

Subject name and code	Physics II, PG_00047733								
Field of study	Biomedical Engineering								
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			
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			4.0			
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	Subject supervisor		dr inż. Sebastian Bielski						
of lecturer (lecturers)	Teachers		dr inż. Sebastian Bielski						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM	
	Number of study hours	15.0	15.0	0.0	0.0		0.0	30	
	E-learning hours included: 0.0								
Learning activity and number of study hours	Learning activity	rning activity Participation in didactic classes included in stud		Participation in consultation hours		Self-study		SUM	
	Number of study 30 hours		5.0			65.0		100	
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_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			
	[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:						
	De Broglie waves. Schrödinger's equation - an operator concept - notation. A problem of eigenvalues and eigenstates. A solution to Schrödinger's equation for one-dimensional motion of a free particle. A particle in the infinite potential well. Hydrogen atom and hydrogen-like ion – Schrödinger's equation. Energy quantization. Spectroscopic notation for eigenstates. Emission and absorption of light. Radial probability density distribution for an electron in hydrogen atom. Atomic and molecular orbitals. Magnetic dipole moment of an electron. The Stern-Gerlach experiment. Spin of an electron. Electric field intensity. Electric field of a point-like charge and of a system of charges. Electric potential of a point-like charge and of a system of charges. Electric field and electric potential. Gauss' theorem. Divergence of electric field. Electric force on a current carrying wire. Magnetic field in vacuum. Interaction between currents. Electric force on a current carrying wire. Ampere's force law. Interaction of two parallel long wires. Generalized Ampere's law. Electromagnetic induction. Electromotive force of electromagnetic induction. Faraday's law. Energy bands structure and the electric properties of solids. Stimulated emission. Laser operation principle.						
	Toturials:						
	Problems related to wave properties of matter. The Heisenberg uncertainty relations. Examples of solution to Schrödinger's equation: potential barrier problem. Bohr's theory of hydrogen atom. Contemporary quantum theory of hydrogen atom and Bohr's model. Electric field analysis of discrete and continuous distribution of charges. Problems related to electric potential. Relationship between the intensity of electric field and electric potential of an electric dipole. Electric dipole moment. The Gauss' law electric field evaluation. Application of Biot-Savart law to magnetic field calculation. The Ampere law magnetic field calculation. Electrodynamic force. Eelectromotive force of electromagnetic induction.						
Prerequisites and co-requisites							
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade				
and criteria	Knowledge of the lecture material.	50.0%	67.0%				
	Solving of the problems.	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					
	Supplementary literature	 Sidney B. Cahn, Boris E. Nadgorny, and Paul D. Scholten, A Guide To Physics Problems. Jackson J. D., Classical Electrodynamics 					
	eResources addresses Adresy na platformie eNauczanie:						
Example issues/ example questions/ tasks being completed	An electron in an infinite quantum well						
	Schrödinger's wave equation.						
	Faraday's law.						
	Energy density of electric and magnetic field.						
Work placement	Not applicable						