GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics II, PG_00047733		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
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
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	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	15.0	0.0	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	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. Relationship between the intensity of electric field and electric potential. Gauss' theorem. Divergence of electric field. Electric field of homogenously charged infinite plane. Magnetic field in vacuum. Interaction between currents. 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 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. 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 and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
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	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: Fizyka II dla IBM 23/24 - Moodle ID: 30288 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30288
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	

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