



## Subject card

Subject name and code	Modern Physics, PG_00047661						
Field of study	Informatics						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2024/2025		
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. 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_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_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.		[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
	[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	<p>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 effect. 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.</p> <p>Laboratory Performing a few experiments; conclusions, error analysis</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 542 794 573">Subject passing criteria</th> <th data-bbox="799 542 1141 573">Passing threshold</th> <th data-bbox="1145 542 1490 573">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 580 794 611">laboratory: oral answers, reports</td> <td data-bbox="799 580 1141 611">50.0%</td> <td data-bbox="1145 580 1490 611">33.0%</td> </tr> <tr> <td data-bbox="453 618 794 649">Knowledge of the lecture material (test)</td> <td data-bbox="799 618 1141 649">50.0%</td> <td data-bbox="1145 618 1490 649">67.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	laboratory: oral answers, reports	50.0%	33.0%	Knowledge of the lecture material (test)	50.0%	67.0%
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Example issues/ example questions/ tasks being completed	<p>How does the maximum possible kinetic energy of electrons <math>E_k</math> depend on the incident light intensity <math>I</math>? We assume that the energy of each photon is greater than the work function.</p> <p>A) <math>E_k</math> does not depend on <math>I</math>          B) <math>E_k</math> increases linearly with <math>I</math>          C) <math>E_k</math> decreases linearly with <math>I</math>          D) more information is needed</p> <p>According to the Gauss' law the electric flux through any closed surface <math>S</math></p> <p>A) is always equal to zero          B) depends only on the electric charges inside <math>S</math>          C) depends only on the electric charges outside <math>S</math>          D) depends on both the electric charges inside and outside <math>S</math></p> <p>The inductance of a solenoid depends on (choose the right answer)</p> <p>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</p> <p>Experiment: determine the moment of inertia of a given object.</p>											
Work placement	Not applicable											