GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modern Physics, PG_00047661		
Field of study	Informatics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2026/2027
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 i Luminescencji -> Faculty Of Applied Physics And Mathematics -> Wydziały Politechniki Gdańskiej		
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, 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

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>laboratory: oral answers, reports</td><td>50.0%</td><td>33.0%</td></tr>
<tr><td>Lecture: final test</td><td>50.0%</td><td>67.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">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</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">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</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">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.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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