



Subject card

Subject name and code	Fundamentals of Physics, PG_00047550						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2024	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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Atomic, Molecular and Optical Physics -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr Mykola Shopa					
	Teachers	dr Mykola Shopa dr inż. Ireneusz Linert					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	0.0	45
	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	45	3.0	27.0	75		
Subject objectives	Providing the student with the specialist knowledge concerning the basic rules of physics immediately relevant to the technical areas.						
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 is able to solve physical problems within the practice classes			[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	As part of the course the student acquires knowledge about chosen physical laws, theories, measurement methods and is able to explain and describe them			[SW1] Assessment of factual knowledge		

Subject contents	<p>LECTURE</p> <p>1. Kinematics and dynamics of a material point. Principle of conservation of energy. Principle of conservation of momentum and angular momentum. Basic properties of gravitational field. Elements of mechanics of fluids.</p> <p>2. Heat, work, internal energy, gas transformations. Elements of kinetic theory of gases. Entropy, reversible and non-reversible processes. Laws of thermodynamics.</p> <p>3. Harmonic oscillator, addition of oscillations. Elastic waves. Basic properties of acoustic waves. Energy density and intensity of wave. Parameters of the medium, wave impedance.</p> <p>4. Elements of geometrical optics. Wave optics: dispersion, interference, diffraction, and polarization of waves. Basics of lasers. Sources of light.</p> <p>5. Einstein's postulates. Lorentz's transformation and its consequences. Relativistic optics.</p> <p>6. Structure of atomic nucleus. Nuclear forces. Radioactivity.</p> <p>7. Wave-particle duality. Wave function. The Heisenberg uncertainty relations. Schrödinger's equation.</p> <p>PRACTICE</p> <p>1. Problems on kinematics of progressive motion, description of the motion in Cartesian system. Velocity, acceleration, normal and tangential acceleration. Problems on kinematics of rotational motion, description of the motion in Cartesian system and in a polar coordinate system. Problems on dynamics of progressive motion, applications of Newton's laws. Dynamics laws in non-inertial frame of reference. Problems on conservation of energy, momentum and angular momentum.</p> <p>2. Problems related to the first law of thermodynamics in the case of an ideal gas. Problems related to Maxwell distribution. Calculation of entropy changes in reversible transformations of an ideal gas.</p> <p>3. Examples of harmonic motion. Basics of wave motion. Wave energy density, Poynting's vector, wave intensity.</p> <p>4. Problems related to the interference of light. Diffraction and polarization of light. Fraunhofer single slit diffraction. Malus's law.</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 1552 794 1585">Subject passing criteria</th> <th data-bbox="799 1552 1137 1585">Passing threshold</th> <th data-bbox="1142 1552 1481 1585">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1585 794 1619">Knowledge of the lecture material</td> <td data-bbox="799 1585 1137 1619">50.0%</td> <td data-bbox="1142 1585 1481 1619">67.0%</td> </tr> <tr> <td data-bbox="456 1619 794 1653">Solving of the problems</td> <td data-bbox="799 1619 1137 1653">50.0%</td> <td data-bbox="1142 1619 1481 1653">33.0%</td> </tr> </tbody> </table>			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%
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Knowledge of the lecture material	50.0%	67.0%										
Solving of the problems	50.0%	33.0%										
Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<p>1. Halliday D., Resnick R., Walker J., Fundamentals of Physics</p> <p>2. Collection of physics problems available at the website: www.mif.pg.gda.pl/zz/</p> <p>1. University Physics, https://openstax.pl/en/</p> <p>Adresy na platformie eNauczanie:</p>										

Example issues/ example questions/ tasks being completed	Conservation of energy, momentum, and angular momentum in the system of particles. Simple harmonic motion. Energy density of the longitudinal wave. Universal law of radioactive decay.
Work placement	Not applicable