



Subject card

Subject name and code	Elements of modern physics, PG_00061199						
Field of study	Elementy fizyki współczesnej						
Date of commencement of studies	October 2023	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	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Division of Automation and Marine Energy -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology -> Wydział Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Małgorzata Śmiałek-Telega					
	Teachers	dr inż. Marcin Dampc dr inż. Łukasz Haryński dr Piotr Weber					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	15.0	0.0	0.0	60
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 1165 Elementy fizyki współczesnej 2025/2026 https://enauczanie.pg.edu.pl/2025/course/view.php?id=1165						
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	60	5.0		60.0		125
Subject objectives	N/A						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W02] possesses an organized knowledge on physics, including classic mechanics, acoustics, optics, electricity and magnetism, shows knowledge of the elements of quantum physics	NA			[SW1] Ocena wiedzy faktograficznej [SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym		
	[K6_U01] is able to acquire information from specialized literary sources, databases and other resources, essential for solving engineering tasks; is able to compile the obtained information pieces and to interpret them, additionally is able to form conclusions and present justified opinion	NA			[SU1] Ocena realizacji zadania [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU4] Ocena umiejętności korzystania z metod i narzędzi [SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania		

Subject contents	<ol style="list-style-type: none"> 1. Oscillations 2. Mechanical waves (including acoustic waves) 3. RLC circuits 4. Electromagnetic waves 5. Geometrical optics 6. Interference and diffraction 7. Electrical conductivity of solids 8. Elements of atomic physics 9. Elements of nuclear physics and nuclear energy 10. Radioactivity 11. Theory of relativity 12. Introduction to quantum mechanics <p>Exercises:</p> <ol style="list-style-type: none"> 1. Mechanical waves (including acoustic waves) 2. RLC circuits 3. Electrical conductivity of solids 4. Elements of nuclear physics and nuclear energy 5. Radioactivity <p>Laboratory (to be selected from by the instructor):</p> <ol style="list-style-type: none"> 1. Determination of the elasticity coefficient of springs and spring systems 2. Measurement of the speed of sound using the resonance method and the composition of mutually perpendicular vibrations 3. Investigation of longitudinal sound waves in rods 4. Determination of Young's modulus using the deflection method 5. Investigation of emission spectra of non-equilibrium gases 6. Determination of slit and obstacle sizes using laser light 7. Determination of the radius of curvature of a lens using Newton's rings 8. Determination of the relative permittivity of solids 9. Measurement of electrical resistance using a Wheatstone bridge 														
Prerequisites and co-requisites	Fundamentals of differential calculus and geometry. Fundamentals of classical mechanics.														
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Problems</td> <td>50.0%</td> <td>30.0%</td> </tr> <tr> <td>Laboratory</td> <td>50.0%</td> <td>30.0%</td> </tr> <tr> <td>Lecture</td> <td>50.0%</td> <td>40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Problems	50.0%	30.0%	Laboratory	50.0%	30.0%	Lecture	50.0%	40.0%
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Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<ol style="list-style-type: none"> 1. David Halliday, Robert Resnick, Jearl Walker, Podstawy fizyki. T. 1-5, Wydawnictwo Naukowe PWN, 2012 3. J. Orear, Fizyka, tom 1 i 2, Warszawa 1998 4. A. Januszajtis, Fizyka dla Politechnik, tom 1-3, Warszawa 1991 5. J. Massalski, M. Massalska, Fizyka dla Inżynierów, tom 1 i 2, Warszawa 2013 <ol style="list-style-type: none"> 1. Hermann Haken, Hans Christoph Wolf, Atomy i kwanty, PWN, 2012 2. Hugh D. Young, University Physics with Modern Physics, 15th Ed. Pearson, Addison-Wesley, 2019 3. Paul A. Tipler, Ralph A. Llewellyn, Fizyka współczesna, Wydawnictwo Naukowe PWN, Warszawa 2012; 4. I.W. Sawieliew, Wykłady z fizyki, tom 1. i 2., Wydawnictwa Naukowe PWN, Warszawa, 2003 													
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. EM wave polarity (linear and unpolarized polarized wave, Malus' law) 2. Law of refraction (pattern with description and drawing) 3. Concave spherical concave mirrors (drawing, diagram of radii, which we get images depending on the placement of the object relative to the mirror) 4. Diffusing lens (drawing, diagram of rays, which we get images depending on the placement of the object in relation to the lens) 5. Constructive event (in which situation it takes place, drawing with description) 6. Young's experiment on two slits (drawing with description, when there are bright colors) when dark stripes, pattern) 														
Practical activities within the subject	Not applicable														

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