



Subject card

Subject name and code	Elements of modern physics, PG_00060477						
Field of study	Mechatronics						
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		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	4	ECTS credits			9.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Zakład Automatyki i Energetyki Morskiej -> Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Małgorzata Śmiałek-Telega					
	Teachers	dr inż. Joanna Grochowalska dr inż. Joanna Grzelak					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	15.0	15.0	0.0	0.0	75
	E-learning hours included: 0.0						
	Additional information: N/A						
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	75	39.0		111.0	225	
Subject objectives	N/A						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W02] has a knowledge in term of physics that includes mechanics, thermodynamics, optics, electricity, magnetism, atomic physics, nuclear physics, solid state physics, including the knowledge necessary to understand basic phenomena occurring in mechatronic elements and systems and its surroundings	The student has systematic knowledge of modern physics: vibrations, mechanical waves, RLC circuits, electromagnetic waves, optics, matter waves, elements of atomic physics and nuclear energy, basics of quantum physics			[SW1] Assessment of factual knowledge		
	[K6_U03] has self-learning skills	The student understands the importance of non-technical aspects and effects of engineering activities, including its impact on the environment.			[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment		
	[K6_U01] is able to acquire information from literature, databases and other, properly chosen sources, integrate these information, interpret them, draw conclusions and formulate opinions	The student understands the importance of non-technical aspects and consequences of engineering activities, including their impact on the environment.			[SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	<p>Lecture:</p> <ol style="list-style-type: none"> 1. Vibrations and mechanical waves 2. RLC circuits 3. Electromagnetic waves 4. Optics in wave terms 5. Optics from a corpuscular perspective 6. Elements of condensed phase physics 7. Elements of atomic physics 8. Elements of physics and nuclear energy <p>Exercises:</p> <ol style="list-style-type: none"> 1. Vibrations 2. Mechanical waves 3. RLC circuits 4. electromagnetic waves 5. Optics <p>Laboratory:</p> <ol style="list-style-type: none"> 1. Knowledge of the principles of operation of elements in an RLC circuit 2. Knowledge of the principles of operation and the ability to connect a system containing a simple sensor 3. Simple assembly of an electronic system that performs a given action 4. Learning to program Arduino and other programs necessary for data visualization 														
Prerequisites and co-requisites	Fundamentals of differential calculus and geometry. Fundamentals of classical mechanics. Basic skills in programming														
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>Lecture</td> <td>50.0%</td> <td>40.0%</td> </tr> <tr> <td>Laboratory</td> <td>50.0%</td> <td>30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Problems	50.0%	30.0%	Lecture	50.0%	40.0%	Laboratory	50.0%	30.0%
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Recommended reading	Basic literature	David Halliday, Robert Resnick, Jearl Walker, Podstawy fizyki. T. 1-5, Wydawnictwo Naukowe PWN, 2012 J. Orear, Fizyka, tom 1 i 2, Warszawa 1998 A. Januszajtis, Fizyka dla Politechnik, tom 1-3, Warszawa 1991 J. Massalski, M. Massalska, Fizyka dla Inżynierów, tom 1 i 2, Warszawa 2013													
	Supplementary literature	https://openstax.org/details/books/university-physics-volume-1 https://openstax.org/details/books/university-physics-volume-2 https://openstax.org/details/books/university-physics-volume-3													
	eResources addresses	Adresy na platformie eNauczanie:													
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. List the properties of metals, insulators and semiconductors; what are the main differences between them? 2. Describe p-n junction 3. Characterise e-m waves, what differs them from mechanical ones? 4. What are the main features of laser light? 5. How does the nuclear reactor work? 														
Work placement	Not applicable														