



Subject card

Subject name and code	Elements of Modern Physics, PG_00060667						
Field of study	Transport and Logistics						
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 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	3	Language of instruction				Polish	
Semester of study	6	ECTS credits				3.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Division of Automation and Marine Energy -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Małgorzata Śmiatek-Telega					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	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	45	3.0	27.0	75		
Subject objectives	N/A						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_U01] can obtain information from literature, databases and other sources; verify and systematize the information obtained, interpret it and draw conclusions, formulate and justify opinions		The student can gather information from various sources: literature, databases, among others. They can integrate the acquired information, interpret it, draw conclusions, and formulate and justify opinions.			[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information	
	[K6_W02] has well structured knowledge of physics, including technical mechanics, fluid mechanics, solid state physics, optics and acoustics necessary to understand the basic physical phenomena occurring in transport		The student has knowledge in physics, including mechanics, thermodynamics, optics, electricity and magnetism, atomic physics, nuclear physics, solid-state physics, including the necessary knowledge to understand basic phenomena occurring in the environment.			[SW1] Assessment of factual knowledge	
	[K6_K01] is aware of the need for continuous improvement in the field of the profession and knows the possibilities of further education		The student possesses the ability for self-learning.			[SK2] Assessment of progress of work	

Subject contents	<p><b>Lecture:</b></p> <ol style="list-style-type: none"> <li>1. Vibrations and mechanical waves</li> <li>2. RLC circuits</li> <li>3. Electromagnetic waves</li> <li>4. Optics in wave terms</li> <li>5. Optics from a corpuscular perspective</li> <li>6. Elements of condensed phase physics</li> <li>7. Elements of atomic physics</li> <li>8. Elements of physics and nuclear energy</li> </ol> <p><b>Exercises:</b></p> <ol style="list-style-type: none"> <li>1. Vibrations</li> <li>2. Mechanical waves</li> <li>3. RLC circuits</li> <li>4. electromagnetic waves</li> <li>5. Optics</li> </ol> <p><b>Laboratory:</b></p> <ol style="list-style-type: none"> <li>1. Knowledge of the principles of operation of elements in an RLC circuit</li> <li>2. Knowledge of the principles of operation and the ability to connect a system containing a simple sensor</li> <li>3. Simple assembly of an electronic system that performs a given action</li> <li>4. Learning to program Arduino and other programs necessary for data visualization</li> </ol>														
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	<a href="https://openstax.org/details/books/university-physics-volume-1">https://openstax.org/details/books/university-physics-volume-1</a>  <a href="https://openstax.org/details/books/university-physics-volume-2">https://openstax.org/details/books/university-physics-volume-2</a>  <a href="https://openstax.org/details/books/university-physics-volume-3">https://openstax.org/details/books/university-physics-volume-3</a>													
	eResources addresses	Adresy na platformie eNauczanie:													
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. List the properties of metals, insulators and semiconductors; what are the main differences between them?</li> <li>2. Describe p-n junction</li> <li>3. Characterise e-m waves, what differs them from mechanical ones?</li> <li>4. What are the main features of laser light?</li> <li>5. How does the nuclear reactor work?</li> </ol>														
Work placement	Not applicable														