



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	Zakład Energetyki i Automatyki 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						
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	Lecture: 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 Exercises: 1. Vibrations 2. Mechanical waves 3. RLC circuits 4. electromagnetic waves 5. Optics Laboratory: 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	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%
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	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		