GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Elements of modern physics, PG_00060477		
Field of study	Mechatronics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
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	Division of Automation and Marine Energy -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Małgorzata Śmiałek-Telega	
	Teachers		

Lesson types

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

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 physic, 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.	[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task
[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

<table>
<tr><td>Subject contents</td><td>Course content – lecture

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</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Fundamentals of differential calculus and geometry. Fundamentals of classical mechanics. Basic skills in programming</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><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></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>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</td></tr><tr><td>Supplementary literature</td><td>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</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. List the properties of metals, inssulators and semiconductors; what are the main diferencies 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 works?</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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