GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modern physics, PG_00063343		
Field of study	Fizyka współczesna		
Date of commencement of studies	October 2024	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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Kamil Kolincio	
	Teachers	dr inż. Kamil Kolincio	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

E-learning hours included: 0.0

eNauczanie source addresses:

Moodle ID: 999 Fizyka współczesna
https://enauczanie.pg.edu.pl/2025/course/view.php?id=999

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	30	5.0	15.0	50

Subject objectives

Getting to know the basic laws of modern physics. Acquiring the ability to analyze physical phenomena and solve technical problems based on the laws of physics.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U01] can learn independently, obtain information from literature, databases and other properly selected sources	The student independently extends the knowledge obtained during the course based on the recommended textbooks and available sources, including the Internet. He or she can assess their substantive quality and skillfully uses them.	[SU2] Ocena umiejętności analizy informacji [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU4] Ocena umiejętności korzystania z metod i narzędzi
[K6_U04] can plan and conduct experiments, critically analyze their results, draw conclusions and formulate opinions. Has laboratory experience.	The student is able to conduct experiments on his own laboratory. He or she can use the instruments available in the laboratory. The obtained results are presented in a report containing correctly formulated conclusions and assessment of measurement uncertainty.	[SU1] Ocena realizacji zadania [SU2] Ocena umiejętności analizy informacji [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU4] Ocena umiejętności korzystania z metod i narzędzi [SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania
[K6_W03] has systematic knowledge within the scope of all branches of general physics (mechanics and study of heat, electricity and magnetism, waves, optics, elements of modern physics).	The student knows the basic branches of modern physics. He can describe groundbreaking experiments leading to the development of quantum physics.	[SW2] Ocena wiedzy zawartej w prezentacji [SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
[K6_W01] has knowledge of materials science and understands its key role in the progress of civilization	The student uses his knowledge of modern physics to describe the world. He or she understands the physical foundations of quantum mechanics and can use them to describe the phenomenon of the microworld	[SW1] Ocena wiedzy faktograficznej

Subject contents

Speed of light, Michelson-Morley experiment, Special theory of relativityTime dilation and length contractionThe relativity of simultaneityLorentz transformationsThe twin paradox and other paradoxesRelativistic dynamics: mass. relativistic momentum and energyEquivalence of mass and energyRelativistic relationship between momentum and energyParticle creationBlackbody radiationThe photoelectric effectWaves and particles, atomic spectra, Pauli exclusion principleEarly models of the atom, Rutherford's experiment and the beginnings of nuclear physics, Bohr's atomWave equations for photons and electronsAngular momentum, electron spin, periodic tableStable and unstable nuclei, decay mechanism, nuclear fission, standard model.Synchrotron radiation

Prerequisites and co-requisites

The course is dedicated to students who have previously successfully completed the general physics course (Physics I and Physics II)

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	50.0%	70.0%
Laboratory	100.0%	30.0%

Recommended reading

Basic literature	1. D. Haliday, R. Resnick, J. Walker, Podstawy fizyki, Wyd. PWN 2. W.Moebs, S.J.Ling, J.Sanny, Fizyka dla szkół wyższych, Tom 3, OpenStax Polska https://cnx.org/contents/u2KTPvIK@8.12:gX9LxBpm@5/5-2-Wzgl%C4%99dno%C5%9B%C4%87-jednoczesno%C5%9Bci-zdarze%C5%84#0 3. J. Massalski, Fizyka dla inżynierów. Część II. Fizyka współczesna, Wyd. WNT P.A. Tipler, R.A. Llewellyn, Fizyka współczesna, Wyd. PWN
Supplementary literature	Ohanian, Hans C., and John T. Markert. Physics for Engineers and Scientists. Vol. 1. 3rd ed. New York, NY: Norton, 2007. ISBN: 9780393930030
eResources addresses	

Example issues/ example questions/ tasks being completed	Lecture: Describe the external photoelectric effect
Practical activites within the subject	Not applicable

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