GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Introduction to Physics of Atom and Atomic Nucleus, PG_00068290		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	first-cycle studies	Subject group	Optional subject group 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	4	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Mateusz Zawadzki	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	15.0	0.0	0.0	60

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	60	5.0	60.0	125

Subject objectives

The lectures and discussion classes aim to present the concepts, selected computational methods, and the experimental foundations of atomic and molecular physics.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U02] can perform tasks related to the field of study in an innovative way as well as solve complex and nontypical problems, applying knowledge of physics, in changing and not fully predictable conditions	The student is able to describe physical phenomena essential for solving specific biomedical problems. They describe important experiments in atomic and molecular physics and interpret their results.	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	The student understands the fundamental concepts of atomic and molecular physics. They solve physical problems and apply the computational methods of quantum mechanics they have learned, as well as analyze and interpret the results of calculations.	[SW1] Assessment of factual knowledge

Subject contents	Course content – lecture Quantum properties of radiation Experimental evidence of the quantum nature of radiation Wave properties of material particles Schrödinger equation Atomic structure Atomic angular momentum Structure of electron shells Atom in a magnetic field: linear and quadratic Zeeman effect X-ray radiation Atomic optics
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
class tests	40.0%	40.0%
Exam	50.0%	40.0%
Lab	100.0%	20.0%

Recommended reading

Basic literature

1. A. Twardowski, Wstęp do Fizyki Atomu i Cząsteczki Ciała Stałego, Wydawnictwa Uniwersytetu Warszawskiego, 2002
2. B.H. Bransden, C.J. Joachain, Physics of atoms and molecules, Longman, 1983
3. R. Resnick, D. Halliday, and J. Walker, Fundamentals of Physics, 7th ed., John Wiley & Sons, 2005
4. Cz. Bobrowski, Fizyka - krótki kurs, WNT, 2012

Supplementary literature

1. H. Haken, H.Ch. Wolf, Atomy i kwanty, PWN, Warszawa, 1997
2. H. Haken, H.Ch. Wolf, Fizyka molekularna z elementami chemii kwantowej, PWN, Warszawa, 1998

eResources addresses

Example issues/ example questions/ tasks being completed	Derivation of the Schrödinger equation. Filling of electron shells. Drawing energy level diagrams for an atom in a magnetic field. Reflection of a particle from a potential barrier under specific boundary conditions. Calculation of the reflection and transmission coefficients for a particle encountering a potential barrier.
Practical activites within the subject	Not applicable

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