GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Introduction to physics of atom and atomic nucleus, PG_00047937		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Atomic, Molecular and Optical Physics -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Mateusz Zawadzki	
	Teachers	dr Mykola Shopa dr hab. Mateusz Zawadzki	

Lesson types and methods of instruction

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	4.0	36.0	100

Subject objectives

Lectures and seminars are designed to present concepts , selected mathematical methods and experimental physics of atoms and molecules.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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	Student knows the basic issues in the field of atomic and particle physics. Student solves physical problems and applies known quantum calculation methods, and analyzes and interprets the results of calculations.	[SW1] Assessment of factual knowledge
[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	Student can describe physical phenomena necessary to solve specific biomedical problems. The student describes important experiences in atomic and molecular physics and interprets their results.	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information

Subject contents

1. Quantum properties of radiation
2. Experimental evidence of the quantum nature of radiation
3. Wave properties of particles of material
4. Schrodinger equation
5. Structure of the atom
6. The angular momentum of the atom
7. Construction of electron shells
8. Atom in a magnetic field: linear and quadratic Zeeman effect
9. X-ray
10. Atomic Optics

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Tutorial - tests</td><td>40.0%</td><td>40.0%</td></tr>
<tr><td>Lab reports</td><td>100.0%</td><td>20.0%</td></tr>
<tr><td>Exam</td><td>50.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. B.H. Bransden, C.J. Joachain, Physics of atoms and molecules, Longman, 1983
2. R. Resnick, D. Halliday, and J. Walker, Fundamentals of Physics, 7th ed., John Wiley & Sons, 2005</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. H. Haken, H.Ch. Wolf, Atomic and quantum physics: an introduction to the fundamentals of experiment and theory, Spronger-Verlag, 1984</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Derivation of Schrődinger equation. Populating the electron orbitals. Drawing diagrams of energy for the atom in presence of the magnetic field . Reflection of a particle from the potential barrier at the specified boundary conditions . Calculating the reflectance and transmission coefficients for particles encountering a barrier potential.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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