



Subject card

Subject name and code	Introduction to physics of atom and atomic nucleus, PG_00047937						
Field of study	Biomedical Engineering						
Date of commencement of studies	October 2023	Academic year of realisation of subject				2025/2026	
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	Katedra Fizyki Atomowej, Molekularnej i Optycznej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Mateusz Zawadzki				
	Teachers						
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.			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject	
Subject contents	<ol style="list-style-type: none"> <li>1. Quantum properties of radiation</li> <li>2. Experimental evidence of the quantum nature of radiation</li> <li>3. Wave properties of particles of material</li> <li>4. Schrodinger equation</li> <li>5. Structure of the atom</li> <li>6. The angular momentum of the atom</li> <li>7. Construction of electron shells</li> <li>8. Atom in a magnetic field: linear and quadratic Zeeman effect</li> <li>9. X-ray</li> <li>10. Atomic Optics</li> </ol>						

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Tutorial - tests	40.0%	40.0%
	Exam	50.0%	40.0%
	Lab reports	100.0%	20.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. B.H. Bransden, C.J. Joachain, Physics of atoms and molecules, Longman, 1983</li> <li>2. R. Resnick, D. Halliday, and J. Walker, Fundamentals of Physics, 7th ed., John Wiley &amp; Sons, 2005</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>1. H. Haken, H.Ch. Wolf, Atomic and quantum physics: an introduction to the fundamentals of experiment and theory, Springer-Verlag, 1984</li> </ol>	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Derivation of Schrödinger 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.		
Work placement	Not applicable		

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