



## Subject card

Subject name and code	Physics of the Atomic Nucleus and Elementary Particles , PG_00047938						
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				3.0	
Learning profile	general academic profile	Assessment form				exam	
Conducting unit	Division of Complex Systems Spectroscopy -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr Brygida Mielewska					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	0.0	45
	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	45		3.0		27.0	75
Subject objectives	To acquaint students with the electronic structure and properties of multi electron atoms, the structure of the atomic nuclei and properties of elementary particles. To show the current medical applications of phenomena arising from the nature of multi atoms, nuclei and elementary particles, and an indication of possible future applications.						
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	student is able to solve the typical problems in nuclear physics			[SU3] Assessment of ability to use knowledge gained from the subject		
	[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 and understands problems related to the structure of atomic structure, generation and interaction of ionizing radiation with matter			[SW1] Assessment of factual knowledge		

Subject contents	<p>Lecture</p> <ol style="list-style-type: none"> <li>1. <b>Atomic structure and particle description</b></li> <li>2. <b>Nuclear Energetics</b></li> <li>3. <b>Radioactivity and Nuclear Reactions</b></li> <li>4. <b>Types of Radioactive Decay</b></li> <li>5. <b>Transmutation Research, Archaeology and Dating</b></li> <li>6. <b>Applications of Radioisotopes in Medicine, Science and Industry</b></li> <li>7. <b>Interaction of radiation with matter</b></li> <li>8. <b>Radiation Detectors</b></li> <li>9. <b>Criticality</b></li> </ol> <p>Problems (modules):</p> <ol style="list-style-type: none"> <li>1. Selected problems of modern physics and special relativity (relativistic energy and momentum, quantization of energy, Heisenberg principle, de Broglie's hypothesis)</li> <li>2. Nuclear structure and properties, binding energy,</li> <li>3. Radioactivity (kinetics of radioactive decay, activity)</li> <li>4. Interaction of ionizing radiation with matter (ranges, Compton effect, photoelectric effect).</li> <li>5. Nuclear reactions, fusion and fission.</li> </ol>											
Prerequisites and co-requisites	Physics - elementary course											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Final exam</td> <td>50.0%</td> <td>50.0%</td> </tr> <tr> <td>Midterm exam</td> <td>50.0%</td> <td>50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Final exam	50.0%	50.0%	Midterm exam	50.0%	50.0%
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Final exam	50.0%	50.0%										
Midterm exam	50.0%	50.0%										
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. H. H. Haken, H. C. Wolf, <i>Atomy i kwanty</i>, PWN, W-wa 1997</li> <li>2. R. Eisberg, R. Resnick, <i>Fizyka kantowa atomów, cząsteczek, ciał stałych, jąder i cząsteczek elementarnych</i>, PWN, W-wa 1983</li> <li>3. H. A. Enge, M.R. Wehr, J. A. Richards, <i>Wstęp do fizyki atomowej</i>, PWN, W-wa 1983</li> <li>4. V. Acosta, C. L. Cowan, B. J. Graham, <i>Podstawy fizyki współczesnej</i>, PWN, W-wa 1987</li> <li>5. E. Skrzypczak, Z. Szaflński, <i>Wstęp do fizyki jądra atomowego i cząstek elementarnych</i>, PWN, W-wa 2002</li> </ol>										

	Supplementary literature	<p>1. A. A. Czerwiński, Energia jądrowa i promieniotwórczość, Oficyna edukacyjna, W-wa 1998</p> <p>2. Sz. Szczęniowski, Fizyka doświadczalna, tom V (fizyka atomu); tom VI (fizyka jądra i cząstek elementarnych), PWN, W-wa 1974</p> <p>3. E. Irdow, I. W. Sawiljew, I. O. Zamsza: Zbiór zadań z fizyki, PWN W-wa 1976</p> <p>4. E. Irodow: Zadania z fizyki atomowej i jądrowej, PWN W-wa 1974</p> <p>5. C. Szmytkowski, W. H. Roznerski, Zadania rachunkowe z wybranych działów fizyki, skrypt PG, Gdańsk 1971</p> <p>6. W. Sadowski (kierownik projektu): Fizyka na Politechnice Gdańskiej, materiały pomocnicze na CD</p>
Example issues/ example questions/ tasks being completed	eResources addresses	Adresy na platformie eNauczanie:
Work placement	Not applicable	

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