GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics of the Atomic Nucleus and Elementary Particles , PG_00047938		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
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, generatrion and interaction of ionizing radiation with matter	[SW1] Assessment of factual knowledge

Subject contents	Lecture 1. **Atomic structure and particle description** 2. **Nuclear Energetics** 3. **Radioactivity and Nuclear Reactions** 4. **Types of Radioactive Decay** 5. **Transmutation Research, Archaeology and Dating** 6. **Applications of Radioisotopes in Medicine, Science and Industry** 7. **Interaction of radiation with matter** 8. **Radiation Detectors** 9. **Criticality** Problems)modules): 1. Selected problems of modern physics and special relativity (relativistic energy and momentum, quantization of energy, Heisenberg principle, de Broglie's hypothesis) 2. Nuclear structure and properties, binding energy, 3. Radioactivity (kinetics of radioactive decay, activity) 4. Interaction of ionizing radiation with matter (ranges, Compton effect, photoelectric effect). 5. Nuclear reactions, fussion and fission.
Prerequisites and co-requisites	Physics - elementary course
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm exam	50.0%	50.0%
Final exam	50.0%	50.0%

Recommended reading	Basic literature	1. H. H. Haken, H. C. Wolf, Atomy i kwanty, PWN, W-wa 1997 2. R. Eisberg, R. Resnick, Fizyka kantowa atomów, cząsteczek, ciał stałych, jąder i cząsteczek elementarnych, PWN, W-wa 1983 3. H. A. Enge, M.R. Wehr, J. A. Richards, Wstęp do fizyki atomowej, PWN, W-wa 1983 4. V. Acosta, C. L. Cowan, B. J. Graham, Podstawy fizyki współczesnej, PWN, W-wa 1987 5. E. Skrzypczak, Z. Szafliński, Wstęp do fizyki jądra atomowego i cząstek elementarnych, PWN, W-wa 2002

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

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