GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics of nuclear processes, PG_00065880		
Field of study	Nuclear Engineering		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
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 inż. Marcin Dampc	
	Teachers	dr inż. Marcin Dampc	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

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	30	8.0	37.0	75

Subject objectives

To familiarize students with the basic phenomena of nuclear physics

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U01] utilizes acquired analytical, simulation, and experimental methods, as well as mathematical models to analyse and evaluate processes occurring in nuclear power sector and related industries	Is able to use the learned phenomena and physical laws, and analyze experimental data in order to understand and evaluate nuclear processes.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information
[K7_U02] formulates and tests hypotheses concerning problems related to processes occurring in Nuclear Power Technologies, their efficiency, rationality, operation, safety and impact on the environment, as well as simple research problems	Is able to draw conclusions about the course of nuclear phenomena based on the known phenomena and physical laws and point out the measurable effects that result from them.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Nuclear Power Technologies, the physics of processes, structure, principle of operation, operation, safety aspects, fuels and materials for reactors, systems, machines and devices of a nuclear power plant	Is able to present, discuss and use the fundamental phenomena of atomic nucleus physics to conduct and analyze laboratory measurements	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents	1. Size of the atomic nucleus, Rutherford's experiment 2. Structure of the atomic nucleus, proton and neutron, isotopes, electrical and magnetic properties of nuclei 3. Binding energy, mass defect, nuclear stability, nuclear fusion and nuclear decay 4. The law of radioactive decay, types of nuclear decay, radiation detectors 5. The liquid-drop model and its applications 6. Elements of quantum mechanics, potential well, Fermi gas model 7. Nuclear shell model and its applications 8. Nuclear reactions Laboratory: 1. Gamma radiation absorption 2. Beta radiation absorption 3. Investigating the range of alpha particles 4. Determination of the isotope decay constant and the age equilibrium state 5. Determination of the q/m ratio of particles in a magnetic field
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory excercises	100.0%	50.0%
Final test	50.0%	50.0%

Recommended reading	Basic literature	Ewa Skrzypczak, Zygmunt Szefliński, *Wstęp do fizyki jądra atomowego cząstek elementarnych* Wydawnictwo Naukowe PWN, 2005 Theo Mayer-Kuckuk, *Fizyka jądrowa* Wydawnictwo Naukowe PWN, 1987 Hermann Haken, Hans Christoph Wolf, *Atomy i kwanty* Wydawnictwo Naukowe PWN, 2002
	Supplementary literature	Bronisław Słowiński *Podstawy fizyczne energetyki jądrowej* Oficyna wydawnicza Politechniki Warszawskiej, 2022
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	State the law of radioactive decay and use it to explain the lifetime of an radioactive isotope.	
Work placement	Not applicable	

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