GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00060375		
Field of study	Nanotechnology		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2023/2024
Education level	second-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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Zakład silnie skorelowanych układów elektronowych -> Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Michał Winiarski	
	Teachers	dr inż. Michał Winiarski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	0.0	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	0.0	0.0	30

Subject objectives

Acquiring knowledge on the interaction of ionizing radiation with materials

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_W02	Student knows the effects of ionizing radiation on materials and devices, including nanodevices.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
K7_W03	Student has a knowledge of atomic and subatomic scale structure of matter and understands its relevance to the interaction with ionizing radiation.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

1. Corpuscular - wave dualism; the Heisenberg uncertainty principle.
2. Models of the atom: the Bohr model; atomic spectra; the Schrödinger equation; potential barrier and tunneling effect; Schrödinger's equation for a hydrogen atom.
3. X-rays.
4. The energy of binding the atomic nucleus. Fundamental interactions.
5. Nuclear models: drip, Fermi gas, shell and collective.
6. Radioactive transformations of atomic nuclei.
7. Fission and fusion reactions and their products
8. The interaction of ionizing radiation with matter: photoelectric effect, Compton effect and creation electron-positron pairs.
9. Size and dosimetry units.
10. The effect of ionizing radiation on living matter, materials and devices.
11. Ionizing radiation detectors.
12. Sources of ionizing radiation in the environment.

Prerequisites and co-requisites

The course is dedicated to students who have completed the experimental physics course.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Homeworks	50.0%	20.0%
Written test	50.0%	80.0%

Recommended reading	Basic literature	1. *University physics, Vol. 3*. OpenStax, 2016. Available on-line free of charge: https://openstax.org/details/books/university-physics-volume-3 2. A. Kamal. *Nuclear Physics*. Berlin-Heidelberg: Springer-Verlag, 2014
	Supplementary literature	S.S.M. Wong. *Introductory Nuclear Physics*. Weinheim, Wiley-VCH, 2004
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Corpuscular - wave dualism; the Heisenberg uncertainty principle. 2. Models of the atom: the Bohr model; atomic spectra; the Schrödinger equation; potential barrier and tunneling effect; Schrödinger's equation for a hydrogen atom. 3. X-rays. 4. The energy of binding the atomic nucleus. 5. Nuclear models: drip, Fermi gas, shell and collective. 6. Radioactive transformations of atomic nuclei. 7. Fission and fusion reactions and their products 8. The interaction of ionizing radiation with matter: photoelectric effect, Compton effect and creation electron-positron pairs. 9. Size and dosimetry units. 10. The effect of ionizing radiation on living matter and the human body. 11. Ionizing radiation detectors. 12. Sources of ionizing radiation in the environment. 13. Selected physical methods of medical diagnosis.	
Work placement	Not applicable	