GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Interaction of ionizing radiation with matter, PG_00039644		
Field of study	Materials Engineering, Materials Engineering, Materials Engineering		
Date of commencement of studies	February 2022	Academic year of realisation of subject	2021/2022
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	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Solid State Physics -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Michał Winiarski	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	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	5.0	50.0	100

Subject objectives

Acquiring knowledge on the interaction of ionizing radiation with matter.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_U03	The ability to make research hypotheses, design experiments necessary for their confirmation and the use of properly selected measurement methods, and laboratory	[SU2] Assessment of ability to analyse information
K7_K01	Understanding the need for lifelong learning, the ability to assess your own limitations, the ability to use expert knowledge.	[SK5] Assessment of ability to solve problems that arise in practice
K7_W05	Knowledge of basic methods, techniques, tools and materials used in solving complex engineering tasks related to the subject.	[SW1] Assessment of factual knowledge
K7_K02	Understanding the importance of non-technical aspects and the effects of engineering activities, including its impact on the environment and the related responsibility for decisions	[SK5] Assessment of ability to solve problems that arise in practice

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.
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.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">The course is dedicated to students who have completed the experimental physics course.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Laboratory</td><td>50.0%</td><td>33.0%</td></tr>
<tr><td>Individual work during the semester (homeworks etc.)</td><td>50.0%</td><td>34.0%</td></tr>
<tr><td>Written test</td><td>50.0%</td><td>33.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. D. Halliday, R. Resnick, J. Walker: Podstawy fizyki, t5, PWN.
2. A. A. Czerwiński: Energia jądrowa i promieniotwórczość, OE
3. A. Z. Hrynkiewicz: Człowiek i promieniowanie jonizujące, PWN 2001.
4. A. Z. Hrynkiewicz, E. Rokita: Fizyczne metody diagnostyki medycznej i terapii, PWN 2013.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">R.Eisberg, R. Resnick, Fizyka kwantowa, PWN</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. Corpuscular - wave dualism; the Heisenberg uncertainty principle.
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<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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