University of Gdańsk

Subject card

Subject name and code	Nuclear Chemistry, PG_00168483		
Field of study	Nuclear safety and radiological protection		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study 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	2	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit	Laboratory of Environmental Analytics and Radiochemistry -> Department of Environmental Chemistry and Radiochemistry -> Faculty of Chemistry -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Grzegorz Olszewski	
	Teachers	dr Karolina Szymańska dr Grzegorz Olszewski	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	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	60	0.0	65.0	125

Subject objectives	The aim of the course is to familiarize chemistry students with the content of lectures and auditorium exercises in nuclear chemistry and to consolidate the knowledge resulting from the physical and chemical processes occurring in the atomic nucleus.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BJORL3_W05] has knowledge of the elementary components of matter and the types of fundamental interactions between them, the manifestations of these interactions in phenomena occurring at scales ranging from subatomic to subatomic, knows the time and energy scales associated with these phenomena; knows the basics of biology and ecology in understanding the biological and ecological aspects of nuclear safety and radiation protection	has knowledge of the elementary components of matter and ecological aspects of nuclear safety and radiological protection	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW3] text preparation/written work
[BJORL3_W06] knows the basic computational methods used to solve typical problems in radiological protection and nuclear safety	knows the basic computational methods used to solve typical problems in the field of radiological protection and nuclear safety	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW3] text preparation/written work
[BJORL3_W01] has a general knowledge of the basic concepts and principles of nuclear physics and chemistry, understands their historical development and their importance not only for nuclear safety and radiation protection, but also for understanding the modern world; has a basic knowledge of biology and ecology	understands nuclear chemistry for nuclear safety and radiological protection and for understanding the modern world; has basic knowledge of biology and ecology	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW3] text preparation/written work
[BJORL3_W04] knows the basic techniques of higher mathematics to the extent necessary to describe phenomena at the subatomic level and solve problems in physics and nuclear chemistry	knows basic techniques in nuclear physics and chemistry	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW3] text preparation/written work
[BJORL3_W03] knows how to plan and perform a simple physical or chemical experiment and analyze the results obtained; knows the elements of the theory of measurement uncertainty as applied to experiments; knows the basic units of the SI system and its most important derived units; knows other systems of measurement units	knows how to plan and perform a simple physical or chemical experiment and analyze the obtained results;	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW3] text preparation/written work
[BJORL3_U04] Can use mathematical and computer apparatus to analyze and solve problems in radiological protection and nuclear safety	can use mathematical apparatus to analyze and solve problems in the field of radiological protection and nuclear safety	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[BJORL3_U03] is able to use the formalism of physics and chemistry to describe phenomena in the microworld; is able to use the methodology of biology and ecology to an elementary extent when describing the effects of radiation on biological objects and in the environment	can use knowledge of physics and chemistry to describe the impact of radiation on biological organisms in the natural environment	[SU1] oral statement/conversation/ discussion [SU3] text preparation/written work [SU4] test/exam - oral or written
[BJORL3_W07] knows the construction and basic principles of operation of scientific apparatus used in radiological protection and aimed at ensuring nuclear safety	knows the structure and basic principles of operation of scientific equipment used in radiological protection	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW3] text preparation/written work
[BJORL3_W02] Understands the role of physical and chemical experimentation, mathematical theoretical models approximating reality, and computer simulations in scientific research methodology; is aware of technological, apparatus, and methodological limitations in scientific research	understands the role of physical and chemical experiment in the methodology of scientific research; is aware of technological, equipment and methodological limitations in scientific research	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW3] text preparation/written work
[BJORL3_U01] can formulate the basic laws of physics and chemistry using mathematical formalism	can formulate the basic laws of physics and chemistry	[SU1] oral statement/conversation/ discussion [SU3] text preparation/written work [SU4] test/exam - oral or written

<table>
<tr><td>Subject contents</td><td>structure of matter and elementary particles, radioactivity, process of formation of chemical elements, natural and artificial radioactive elements, radiogenic heat of the Earth, nuclear energy, interaction of ionizing radiation with matter, radiation chemistry and radiolysis of water, dosimetry, radiometric and radiochemical methods, isotope separation and labeling methods compounds, use of radionuclides in science, technology and medicine.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>• knowledge of the theory of the structure of matter and atoms of chemical elements
• lecture on the basics of chemistry and physics</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>passed excercises</td><td>51.0%</td><td>40.0%</td></tr>
<tr><td>written test</td><td>51.0%</td><td>60.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>• Bogdan Skwarzec, Environmental radiochemistry, University of Gdańsk Publishing House, 2021, ISBN 978-83-8206-111-6
• Sobkowski J. Jelińska-Kaźmierczuk M., Nuclear chemistry, Adamantan Publishing House, Warsaw 2006, ISBN: 83-7350-080-4</td></tr>
<tr><td>Supplementary literature</td><td>not applicable</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>• The main elementary particles
• Radioactive decay
• Radiation doses</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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