



## Subject card

Subject name and code	, PG_00053506						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
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	6	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Zakład Spektroskopii Układów Złożonych -> Instytut Fizyki i Informatyki Stosowanej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Brygida Mielewska				
	Teachers		mgr inż. Marcin Byczuk dr Brygida Mielewska				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	15.0	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	Acquainting students with physical quantities and types of calculations typical for dosimetry and radiation protection as well as quality control in radiology						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[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 the mechanisms of interaction of various types of radiation with tissues			[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation		
	[K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Student is able to design a specific shieldings and test its shielding parameters in accordance with the applicable standards			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		
[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 calculate the dose absorbed from various types of radiation; Student understands how to use radiation shielding and is able to design them			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment			

Subject contents	Lectures and problems::  1. Fundamentals of nuclear physics. 2 Principles, quantities and units of radiological protection. 3. Radiation dose limits. 4. Specificity of interaction of different types of radiation with tissue. 5. Types of ionizing radiation sources. 6. Radiation shields, multiplicity for wide and collimated beam. 7. Internal exposure assessment. 8. Categories of employees, controlled and supervised area. 9. Classification of radioactive waste. 10. Consent to launch the workshop. 11. Emergency plan. 12. Quality control of radiation sources in medicine.		
Prerequisites and co-requisites	Nuclear Physics basic course		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	problem solving	50.0%	50.0%
	project	50.0%	50.0%
Recommended reading	Basic literature	Klaus Grupen "Introduction To Radiation Protection" 2010	
	Supplementary literature	Herman and Cember "Introduction to Health Physics" McGrawHill Medical	
	eResources addresses	Adresy na platformie eNauczanie: Ochrona Radiologiczna i kontrola jakości w radiologii 2023 - Moodle ID: 26966 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26966">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26966</a>	
Example issues/ example questions/ tasks being completed	A radioactive material possesses an approximately constant gammaactivity of 1GBq. Per decay 1.5MeV are liberated. What is the dailyenergy dose if the ionizing radiation is absorbed in an amount ofmaterial of mass $m = 10 \text{ kg}$ ?		
Work placement	Not applicable		