University of Gdańsk

Subject card

Subject name and code	Radiobiology for Medical Physics, PG_00210343						
Field of study	Medical Physics						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2026/2027			
Education level	Master's 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	2		Language of instruction	Polish			
Semester of study	3		ECTS credits	3.0			
Learning profile	academic		Assessment form	credit			
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Anna Synak				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	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		0.0	30.0	75	
Subject objectives	The aim of the course is to provide medical physics students with practical and applicable knowledge in the field of radiobiology, with a focus on its application in radiotherapy clinical practice and radiation protection.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[FIZMEDMU2_K03] He is ready to take a scientific approach to the issues being solved, using scientific literature, as well as expert opinions, in case of difficulties in solving the problem on his own.	The student is prepared to critically evaluate information on the radiobiological effects of ionizing radiation and to incorporate current scientific evidence when analyzing issues related to radiotherapy and radiation protection.	[SK4] test/exam - oral or written
[FIZMEDMU2_U06] Can effectively communicate on specialised topics in the field of physics and medical physics with diverse audiences (specialists and non-specialists), skillfully justifying his/her position.	The student is able to communicate topics related to radiobiology and the biological effects of ionizing radiation to both specialists and non-specialists, justifying their views using current scientific evidence and appropriate scientific terminology.	[SU4] test/exam - oral or written
[FIZMEDMU2_W01] Knows and understands in depth selected issues in the field of physics and medicine, the complex relationships between them, and development trends in the exact and natural sciences, health sciences, and others.	The student understands the mechanisms of interaction between ionizing radiation and cells and tissues, the mechanisms of healthy and tumor tissue responses to irradiation, dose–response models, and the significance of radiobiological parameters in radiotherapy treatment planning, treatment optimization, and patient radiation protection.	[SW4] test/exam - oral or written
[FIZMEDMU2_W04] Knows and understands in depth the theoretical foundations and principles of operation of measurement systems and research, diagnostic and therapeutic equipment specific to the field of physics and medicine.	The student understands the theoretical foundations of the methods and models used in radiobiology to assess the effects of ionizing radiation on cells and tissues, and their application in radiotherapy treatment planning, treatment optimization, and radiation protection.	[SW4] test/exam - oral or written
[FIZMEDMU2_W06] Knows and understands the current directions of development of physics and medical sciences, especially in the field of medical physics, and the fundamental dilemmas of modern civilisation.	The student understands current developments in radiobiology and their significance for the assessment of the biological effects of ionizing radiation, the interpretation of radiation incidents, and the application of radiobiological parameters in radiotherapy treatment planning, treatment optimization, and patient radiation protection.	[SW4] test/exam - oral or written

Subject contents

- Interaction of ionizing radiation with living cells
- Interaction of ionizing radiation with tissues
- Development of radiation-induced damage in healthy tissues
- Development of radiation-induced damage in tumor tissues
- Mechanisms of healthy tissue response to radiation-induced damage
- Mechanisms of tumor tissue response to radiation-induced damage
- Dose–response models
- Application of radiobiological parameters in treatment planning and optimization, as well as in patient radiation protection
- Description and analysis of real radiation accidents and incidents with regard to their radiobiological effects and consequences.

Prerequisites and co-requisites

Basic knowledge of the English language.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
written test	51.0%	100.0%

Recommended reading

Basic literature

1. Joiner, Michael C., and Albert van der KogeJ. *Basic clinical radiobiology*. CRC press, 2009.

	Supplementary literature	1. Malicki, Julian, and Krzysztof Ślosarek. *Planowanie leczenia i dozymetria w radioterapii Tom I*. Vol. 1. VM Media Sp. z oo VM Group Sp. k., Grupa Via Medica, 2016. 2. INTERNATIONAL ATOMIC ENERGY AGENCY, *Radiation Biology: A Handbook for Teachers and Students* , Training Course Series No. 42, IAEA, Vienna (2010). 3. INTERNATIONAL ATOMIC ENERGY AGENCY, *Lessons Learned from Accidental Exposures in Radiotherapy* , Safety Reports Series No. 17, IAEA, Vienna (2000)
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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