University of Gdańsk

Subject card

Subject name and code	Advanced Methods of Treatment Planning in Radiotherapy, PG_00210342						
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	45.0	0.0	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 present students with the real-time preparation of radiotherapy treatment plans for various anatomical sites using modern 3D and 4D radiotherapy techniques. Radiotherapy planning for: primary brain tumors, craniospinal axis irradiation, head and neck cancers, lung cancers, esophageal and gastric cancers, rectal cancers, and prostate cancer. Stereotactic radiotherapy planning for: brain metastases, focal liver lesions, lung tumors, and kidney tumors. Planning of total body irradiation. Planning of palliative radiotherapy.						

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 analyze and evaluate solutions used in radiotherapy treatment planning, justify decisions based on current scientific evidence, clinical guidelines, and best practices, and continuously enhance their professional competencies through the critical review of specialist literature and the exchange of knowledge and experience within the professional community.	[SK2] presentation/project/paper/ report
	[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 principles of radiotherapy treatment planning for different tumor sites using contemporary treatment planning techniques, including 3D and 4D treatment planning, stereotactic radiotherapy, total body irradiation, and palliative radiotherapy. The student understands the impact of the selected irradiation technique, target volume and organ-at-risk delineation, and treatment planning parameters on dose distribution, treatment plan quality, and the safety of radiotherapy.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
	[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 and operating principles of the equipment and measurement systems used in radiotherapy treatment planning and delivery, including imaging systems, clinical dosimetry systems, treatment planning systems, and linear accelerators. The student also understands the relationships between radiation beam characteristics, dosimetric parameters, the performance of therapeutic systems, and treatment plan quality.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
	[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 advances in radiotherapy treatment planning and irradiation techniques, including advanced imaging methods, 3D and 4D treatment planning, stereotactic radiotherapy, and advances in optimization algorithms and treatment planning systems. The student understands the importance of advances in clinical dosimetry, radiobiology, and linear accelerator technologies for personalized treatment, improved treatment plan quality, and enhanced radiotherapy effectiveness and safety.	[SW2] presentation/project/paper/ report [SW3] text preparation/written work
Subject contents	The lecture covers, among others, such topics as the fundamental principles of clinical dosimetry, photon interactions with matter, and the structure of a linear accelerator. Issues related to radiation beam characteristics and radiobiology will also be discussed. The course will further address the fundamentals of radiotherapy, including patient immobilization, treatment simulation, and factors affecting the planned dose distribution. More advanced aspects of the treatment process will also be covered, such as the therapeutic pathway and the radiotherapy treatment planning process itself.		
Prerequisites and co-requisites	None		

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Presentation; test consisting of multiple-choice and open-ended questions</td><td>51.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Philip Mayles, Alan E. Nahum, J.C. Rosenwald, “Handbook of Radiotherapy Physics”
2. J.Malicki, K.Ślosarek, „Planowanie leczenia i dozymetria w radioterapii Tom 1 oraz Tom 2”
3. Gunderson and Tepper, “Clinical Radiation Oncology”
4. Faiz M. Khan Ph.D (Editor), John P. Gibbons Ph.D (Editor), Paul W. Sperduto M.D. MPP FASTRO (Editor), “Khan's Treatment Planning in Radiation Oncology”</td></tr>
<tr><td>Supplementary literature</td><td>none</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2"></td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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