

Subject card

Subject name and code	Hybrid Medical Devices, PG_00210211						
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	4		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	<						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[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 knows and understands the theoretical foundations of image formation in Positron Emission Tomography (PET) and in hybrid imaging systems such as PET/CT and PET/MR. The student understands the physical and technical factors involved in image acquisition, reconstruction, and analysis, as well as the causes of imaging artifacts and their impact on the diagnostic value of examinations. The student is familiar with the operating principles of modern PET equipment, including detectors, data acquisition systems, image correction and reconstruction algorithms, and understands how technical parameters influence image quality, sensitivity, spatial resolution, and the accuracy of quantitative assessment.	[SW4] 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 knows and understands the complex relationships between the physical principles and diagnostic capabilities of hybrid PET/CT and PET/MR systems, with particular emphasis on their application in dynamic imaging studies and the quantitative assessment of biological processes occurring in organs and tissues. The student is familiar with the methodology of advanced PET examinations, including patient preparation, indications and contraindications for specific procedures, as well as the limitations of individual imaging techniques. The student understands the importance of modern molecular imaging methods in diagnosis, treatment monitoring, and personalized medicine, and is aware of future perspectives and developments in PET technology, including novel radiotracers, advanced image reconstruction methods, and next-generation hybrid imaging systems.	[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 knows and understands advanced Positron Emission Tomography (PET) imaging techniques, including hybrid PET/CT and PET/MR imaging, dynamic imaging, quantitative studies, and the application of novel radiotracers, as well as their significance for the advancement of molecular diagnostics. The student understands how modern PET techniques enable the assessment of metabolic, receptor, and functional processes occurring within the body and address key diagnostic challenges in contemporary medicine, particularly in oncology, neurology, and cardiology.	[SW4] test/exam - oral or written

	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 continuously enhance their professional competencies by keeping abreast of the latest developments in Positron Emission Tomography (PET), hybrid PET/CT and PET/MR imaging, and novel radiopharmaceuticals used in molecular diagnostics. The student demonstrates a proactive attitude toward promoting knowledge of modern nuclear medicine techniques and their diagnostic capabilities, for example through the analysis and discussion of clinical cases in which PET imaging contributed to disease diagnosis, prognostic assessment, or changes in therapeutic management. The student is committed to upholding the professional standards and traditions of the medical physicist profession by carrying out responsibilities related to the planning, implementation, and quality assurance of PET procedures, maintaining appropriate documentation, and ensuring radiation safety for both patients and staff within a multidisciplinary healthcare team.	[SK4] test/exam - oral or written
Subject contents	The course provides an overview of modern diagnostic capabilities in contemporary nuclear medicine, with particular emphasis on hybrid and specialized imaging systems such as PET/CT, PET/MR, D-SPECT, intraoperative gamma cameras and probes, and Positron Emission Mammography (PEM). The principles of operation, clinical applications, and the role of these technologies in disease diagnosis and treatment monitoring are presented. In addition, the course highlights the broad spectrum of methods used in nuclear medicine, emphasizing that the field extends beyond PET and SPECT techniques to include a variety of other advanced diagnostic and therapeutic approaches.		
Prerequisites and co-requisites	None		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	test	51.0%	100.0%
Recommended reading	Basic literature	T. B. Lynch - PET/CT in Clinical Practice – DOI https://doi.org/10.1007/978-1-84628-504-2	
	Supplementary literature	Author's own materials	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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