University of Gdańsk

Subject card

Subject name and code	Nuclear Medicine and Quality Control in Nuclear Medicine, PG_00182171						
Field of study	Medical Physics						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2028/2029			
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	3		Language of instruction	Polish			
Semester of study	6		ECTS credits	4.0			
Learning profile	academic		Assessment form	exam			
Conducting unit	Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		mgr inż. Celina Kruszyńska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	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	60.0		120
Subject objectives	1. Gaining knowledge of the physical and instrumental principles of nuclear medicine, as well as the principles of creating and reconstructing a radioisotope image. 2. Understanding the specific acquisition protocols for different radioisotope examinations. 3. Ability to independently perform quality control tests.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[FIZMEDL3_W07] Knows and understands at an advanced level the concepts of diagnostic and therapeutic methods and their quality control in medical applications.	The student knows and understands advanced medical imaging methods in nuclear medicine, such as SPECT/CT and PET/CT, and can explain their clinical application. The student understands the operating principles and mechanisms of isotope therapy in the treatment of cancer and other diseases. The student knows and understands the fundamentals of radiopharmaceutical quality control and its impact on patient safety and examination efficacy. The student understands key concepts in image quality control, such as resolution, uniformity, and linearity, and knows how they affect the diagnostic quality of radioisotope images.	[SW4] test/exam - oral or written
[FIZMEDL3_K02] He is ready to constantly update his knowledge in physics and medical physics to solve cognitive and practical problems independently and to use the opinions and assistance of experts.	The student is ready to independently search for and analyze the latest scientific findings regarding radiopharmaceuticals, new imaging techniques (e.g., PET/CT), and isotope therapy. The student demonstrates an open attitude toward collaborating with experts (e.g., physicians, pharmacologists, technologists) to solve complex problems in radiopharmacology and diagnostics, recognizing the value of an interdisciplinary approach. The student is ready to utilize the opinions and assistance of other specialists to verify the correctness of quality control tests performed on the equipment.	[SK2] presentation/project/paper/report
[FIZMEDL3_U09] Can communicate effectively with colleagues and other employees, works in a team, including interdisciplinary teams, and manages his/her own and his/her colleagues' time appropriately.	The student can effectively communicate with the medical team, clearly presenting the operating principles of equipment (SPECT, PET) and the results of quality control tests. The student demonstrates the ability to work in an interdisciplinary team, for example, with radiopharmacists, to ensure the correct preparation of radiopharmaceuticals for examinations. The student can properly manage time when performing multiple equipment quality control tests, such as measurements of linearity, centre of rotation, or resolution, to effectively manage laboratory work.	[SU2] presentation/project/paper/report
[FIZMEDL3_K01] He is ready for a critical evaluation of his own knowledge and the information he receives, and understands the need for further education and for improving professional and personal competencies.	The student demonstrates a critical attitude toward their own knowledge and laboratory results (e.g., image uniformity tests), striving to identify errors and improve procedures. The student understands and accepts the need for continuous competency development due to the dynamic evolution of nuclear medicine equipment and examination protocols. The student is ready for self-reflection on their skills in equipment calibration or image fusion and to take action to improve them.	[SK2] presentation/project/paper/report

Course outcome	Subject outcome	Method of verification
[FIZMEDL3_W09] Knows at an advanced level the construction and operating principles of measurement instruments, electronic systems, and diagnostic and therapeutic equipment used in physics research and in medical diagnosis and therapy.	The student knows the construction and operating principles of conventional nuclear medicine equipment, as well as advanced hybrid systems (SPECT/CT and PET/CT). The student knows the operating principles of basic dosimetric and measuring instruments, as well as their role in equipment calibration and quality control. The student describes the mechanisms of image formation and reconstruction in various nuclear medicine techniques (SPECT, PET), accounting for the differences between them. The student understands the importance of equipment calibration (using point and planar sources) and quality control to ensure the proper functioning of diagnostic devices.	[SW4] test/exam - oral or written
[FIZMEDL3_W08] Knows and understands the mechanisms of general and specific pathology, the pathogenesis of diseases and dysfunctions, the fundamentals of clinical examination, and the role of radiological and radioisotope studies in clinical diagnosis.	The student knows and understands the general mechanisms of disease and dysfunction in systems where radioisotope examinations are used (e.g., skeletal, circulatory, respiratory systems), and knows how these mechanisms are visualized in nuclear medicine. The student knows and understands the role of radioisotope examinations as a diagnostic tool in the clinic, including their advantages and limitations compared to other imaging techniques. The student describes the role of image fusion (e.g., PET/CT) in the precise localization and diagnosis of pathologies.	[SW4] test/exam - oral or written

Subject contents

A. Lecture Topics

- Fundamentals of Nuclear Medicine: This section covers ionizing radiation and radioisotopes used in medicine, along with the basics of radiopharmacy and radiopharmacology. It also addresses nuclear medicine equipment, including conventional systems, SPECT, PET, and hybrid SPECT/CT and PET/CT scanners. Students will learn about fundamental radioisotope examinations of the skeletal, circulatory, and respiratory systems, as well as in endocrinology, and will cover isotope therapy.
- Quality Control in Nuclear Medicine: This part of the course focuses on key concepts such as intrinsic and extrinsic resolution, image uniformity, linearity, center of rotation, and calibration using point and planar sources. It also includes the fundamentals of radiopharmaceutical quality control, image fusion, and the quality control of hybrid equipment.

B. Laboratory Topics

- Performing quality control tests.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
not applicable	51.0%	50.0%
not applicable	51.0%	50.0%

Recommended reading

Basic literature	not applicable
Supplementary literature	not applicable
eResources addresses	

Example issues/ example questions/ tasks being completed

not applicable

Work placement

Not applicable

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