



Subject card

Subject name and code	Medical Imaging, PG_00050111						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2029/2030	
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	4	Language of instruction				Polish	
Semester of study	7	ECTS credits				3.0	
Learning profile	general academic profile	Assessment form				exam	
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Artur Poliński					
	Teachers	dr inż. Artur Poliński					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	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	30	3.0	42.0	75		
Subject objectives	The objective of the course is to familiarize students with advanced medical imaging methods. Students will learn the physical principles behind various imaging techniques, mathematical transformations used in image reconstruction, filtering methods, and data visualization techniques. An integral component of the course is a team-based project focused on analyzing and comparing selected imaging methods and developing a practical engineering solution using available computational tools and medical data.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W51] Knows and understands, to an advanced extent, selected aspects of biomedical diagnostics and human anatomy and physiology, constituting general knowledge related to the field of study	has basic knowledge of various tom			[SW1] Assessment of factual knowledge		
	[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	has basic knowledge of various tomographies			[SW1] Assessment of factual knowledge		
	[K6_U12] can analyze the operation of components, circuits and systems related to the field of study, as well as measure their parameters and examine technical specifications, and plan and conduct experiments related to the field of study, including computer simulations and measurements, and interpret obtained results and draw conclusions	Students will explore the principles of operation and image processing techniques used in selected medical imaging modalities. The project involves analyzing reconstruction algorithms, filtration methods, physical principles, and mathematical transformations enabling comparative evaluation of different imaging approaches.			[SU1] Assessment of task fulfilment		

Subject contents	<p>Course content – lecture Lecture</p> <p>1. CT tomography. 2 Image reconstruction in CT tomography. 3. Direct and inverse Radon transform. 4. Filtration in CT. 5. MRI tomography. 6. 2D and 3D reconstruction in MRI. 7. T1 and T2 weighted images. 8 fMRI, 9. SPECT tomography, 10. PET tomography, 11. Issues related to image reconstruction in SPECT and PET tomography</p> <p>Project: Team-based project on medical imaging and data reconstruction in CT, MRI, SPECT, PET, X-ray (RTG), and DXA. As part of the work, students will explore the principles of operation and image processing techniques used in selected medical imaging modalities. The project involves analyzing reconstruction algorithms, filtration methods, physical principles, and mathematical transformations enabling comparative evaluation of different imaging approaches.</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 595 794 629">Subject passing criteria</th> <th data-bbox="799 595 1137 629">Passing threshold</th> <th data-bbox="1142 595 1469 629">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 636 794 669">project</td> <td data-bbox="799 636 1137 669">51.0%</td> <td data-bbox="1142 636 1469 669">50.0%</td> </tr> <tr> <td data-bbox="456 676 794 701">exam</td> <td data-bbox="799 676 1137 701">51.0%</td> <td data-bbox="1142 676 1469 701">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	project	51.0%	50.0%	exam	51.0%	50.0%
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Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<p>Chmielewski L., Kulikowski J.L., Nowakowski A. (red.) <i>Obrazowanie biomedyczne. Biocybernetyka i Inżynieria Biomedyczna 2000</i>, Tom 8, Akademicka Oficyna Wydawnicza Exit 2003, Torbicz, W. (Red.). <i>Obrazowanie biomedyczne</i> (T. 8, red. tomu: A. Nowakowski, M. Kaczmarek, L. Królicki, J. L. Kulikowski). Oficyna Wydawnicza EXIT, 2020, Cho Z.-H., Jones J. P., Singh M., <i>Foundations of Medical Imaging</i>, John Wiley & Sons 1993 Cierniak R., <i>Tomografia komputerowa. Budowa urządzeń CT. Algorytmy rekonstrukcyjne</i>, Akademicka Oficyna Wydawnicza Exit 2005 Cornelis J., <i>An introduction to medical magnetic resonance imaging</i>, VUB, Brussel 1998, Vieverger M. A., Todd-Pokropek A., <i>Mathematics and computer science in medical imaging</i>, Springer-Verlag 1988, Fortuna Z., Macukow B., Wąsowski J., <i>Metody numeryczne</i>, Stoer J., Bulirsch R., <i>Wstęp do analizy numerycznej</i>, PWN 1987</p> <p>No requirements</p>										
Example issues/ example questions/ tasks being completed	<p>Lecture</p> <ol style="list-style-type: none"> 1. Discuss the principles of image reconstruction in CT tomography. 2. Discuss the principles of image reconstruction in MRI. <p>Project:</p> <ol style="list-style-type: none"> 1. Analysis of CT image reconstruction quality using Matlab or Python (<i>Investigation of the impact of beam selection and filtration methods</i>) 2. Analysis of medical images in the DICOM standard using available software and any programming language 											
Practical activities within the subject	Not applicable											

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