GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Methods of Reconstruction and Analysis of Images, PG_00053512		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
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	3	Language of instruction	Polish
Semester of study	6	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Artur Poliński	
	Teachers	dr Tomasz Neumann dr inż. Artur Poliński dr inż. Anna Węsierska	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	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	17.0	50

Subject objectives

Introduction to image reconstruction and analysis

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	Knows selected methods of image reconstruction	[SU1] Assessment of task fulfilment
[K6_W04] knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	Student - Describes forward and inverse problem for the various modalities - Describes the stages of measurement data collection and processing - Calculates results for the reconstruction of simple objects - Compares the quality of reconstruction for selected modalities	[SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>1. Forward problem 2. Inverse problem 3. Source inverse problem 4. Existence, uniqness, condition and stability of IP 5. Examples of inverse and forward problems 6. Fourier Transformation in imaging 7. Forward problem in CT 8. Methods of reconstruction in CT 9. Methods of reconstruction in CT - back projection 10. Methods of reconstruction in CT - algebraic 11. Methods of reconstruction in CT - Fourier 12. Methods of reconstruction in CT - filtered BP 13. Forward problem in MRI 14. Inverse problem and reconstruction in MRI 15. Reconstruction in parallel measurement systems 16. Dynamic and activity examinations 17. FMRI-reconstruction and properties 18. Brain in dymanic MRI and CT 19. Parametric images synthesis in brain perfusion evaluation 20. Fusion of multimodal images 21. Description and analysis of images 22. Representation of regions - region description (RLE, ..) 23. Representation of regions - description of contours (chain codes, signitures, Fourier descriptors, ...) 24. Parametrization and descriptors, descritpors of geometrical properties 25. Parametrization and descriptors, statistical moments 26. Parametrization and descriptors, intensity descriptors 27. Parametrization and descriptors, colour descriptors 28. Parametrization and descriptors, texture descriptors 29. Parametrization and descriptors, texture descriptors - statistic description 30. Parametrization and descriptors in MPEG7</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>No requirements</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>exam</td><td>51.0%</td><td>40.0%</td></tr>
<tr><td>Laboratory</td><td>51.0%</td><td>60.0%</td></tr>
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</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>B.H. Brown i inn. Medical physics and biomedical engineering, IOP, 2001 Instrukcje do ćwiczeń L. Chmielewski, J.K. Kulikowski, A. Nowakowski, Biocybernetyka i Inż. Biomed. 2000, t. 8, Obrazowanie Biomedyczne, Exit, 2003 R. B.Buxton, Introduction to functional magnetic resonance imaging, Cambridge University Press, 2002 Z.-H. Cho, J.P. Jones, M.Singh, Foundations of medical imaging, J.Wiley&Sons, 1993</td></tr>
<tr><td>Supplementary literature</td><td>No requirements</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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