GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of Image Processing, PG_00047790		
Field of study	Biomedical Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2022/2023
Education level	first-cycle 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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jacek Rumiński	
	Teachers	prof. dr hab. inż. Jacek Rumiński dr inż. Artur Poliński dr hab. inż. Mariusz Kaczmarek	

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	2.0	18.0	50

Subject objectives	The aim of the course is to familiarize students with selected issues relating to computer graphics and image processing, and developing the ability to use methods of analysis and image processing in the implementation of tasks in the field of biomedical engineering.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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 knowledge gained: - Select of appropriate techniques to improve the quality of images, - Use basic methods of digital image processing techniques, - to apply digital image processing techniques to build a realistic three-dimensional scenes,	[SW1] Assessment of factual knowledge
[K6_U53] can apply equipment used in biomedical diagnostics	Student skills gained: - The ability to image acquisition for archiving and subsequent analysis, - Ability to selection of appropriate techniques to improve the quality of images, - Use basic methods of digital image processing techniques, - The ability to apply in practice certain methods of processing and image analysis used in scientific applications, particularly in the field of biomedical engineering, - The ability to apply digital image processing techniques to build a realistic three-dimensional scenes, - Practical skills to prepare for professional graphic materials for print and web publishing, multimedia.	[SU1] Assessment of task fulfilment
[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	Student knowledge gained: - The ability to image acquisition for archiving and subsequent analysis,	[SW1] Assessment of factual knowledge

Subject contents

1. Image perception and cognition 2. Models and representation of images 3. Image acquisition and synthesis 4. Typical images, image sources and image acquisition devices 5. Color spaces 6. Single-pixel based image processing 7. Multiple-pixel based image processing. Image algebra 8. Application of mathematical morphology 9. Image enhancements: convolution and filtration 10. Image enhancements: nonlinear filtration 11. Image enhancements: histogram transformations 12. Image enhancements: histogram equlization and matching 13. Geometry transformation: rigid and non rigid transforms 14. Geometry transformation: affine and perspective methods 15. Image sequences: animations and virtual reality 16. 2D and 3D vector graphics 17. Processing of 3D graphics - textures: synthesis and rendering 18. Processing of 3D graphics - controlling of lighting

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Practical exercise	50.0%	50.0%
Midterm colloquium	50.0%	50.0%

Recommended reading

Basic literature	A. Watt, 3D Computer Graphics, Addison Wesley, 2000. Geoff Dougherty, Digital Image Processing for Medical Applications, Cambridge University Press Distance learning resources, access: http://uno.biomed.gda.pl
Supplementary literature	No requirements
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable