GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Graphics Systems, PG_00048265
Field of study	Informatics, Biomedical Engineering, Biomedical Engineering, Biomedical Engineering

Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
Education level	second-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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Intelligent Interactive Systems -> Faculty of Electronics, Telecommunications and Informatics		

Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mariusz Szwoch
	Teachers	dr inż. Mariusz Szwoch

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	4.0	16.0	50

Subject objectives	Teaching students: • fixed and programmable graphics rendering pipeline • high- and low-level graphic libraries for open and closed platforms • Khronos consortium open graphics rendering standards • the latest cross-platform graphics rendering solutions, including Vulkan and SPIR-V

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	Student uses graphics libraries. Student creates graphic applications using OpenGL and Direct3D libraries.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	[K7_W01] Knows and understands, to an increased extent, mathematics to the extent necessary to formulate and solve complex issues related to the field of study.	Student describes the structure and the way of use of graphic libraries OpenGL and Direct3D in graphics rendering. Shows the stages of rendering of 3D scenes. Points the differences between fixed and programmable rendering pipeline. Differentiatesfunctions of particular shaders.	[SW1] Assessment of factual knowledge
	[K7_U07] can apply advanced methods of process and function support, specific to the field of study	Student uses graphics libraries. Student creates graphic applications using OpenGL and Direct3D libraries.	[SU4] Assessment of ability to use methods and tools
	[K7_U42] can solve engineering and research problems including design, assessment and maintenance of information systems and applications, using experimental methods and management techniques	Student uses graphics libraries and knows the methods of managing multimedia database. Student creates graphic applications using OpenGL and Direct3D libraries.	[SU1] Assessment of task fulfilment
	[K7_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 the structure and the way of use of graphic libraries OpenGL and Direct3D in graphics rendering. Shows the stages of rendering of 3D scenes. Points the differences between fixed and programmable rendering pipeline. Differentiatesfunctions of particular shaders.	[SW1] Assessment of factual knowledge

Subject contents	1. Introduction, 2D and 3D graphics in computer systems 2. Graphic library OpenGL - introduction, compatibility, installation, auxiliary libraries 3. OpenGL: primitives, transformations, projections, colours 4. OpenGL: 3D objects modelling, lighting, materials 5. OpenGL: textures, buffers, special effects 6. Fixed and programmable rendering pipelines and GPUs 7. Programmable vertex and fragment/pixel shaders 8. Shading languages basing on CPU and GPU, assembler 9. Shading languages Cg/HLSL 10. Shading language GLSL 11. Vulkan and DirectX12 graphics libraries 12. Multimedia library DirectX - introduction, compatibility, components, installation, SDK 13. DirectX architecture, .X format, graphics rendering pipeline, 3D scene rendering 14. DirectX 3D scene creation: views, primitives, objects, lighting, texturing 15. Graphics libraries for mobile devices: OpenGL ES

Prerequisites and co-requisites	

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	51.0%	50.0%
	Exam	51.0%	40.0%
	Activity/presence	51.0%	10.0%

Recommended reading	Basic literature	1. R.S. Wright jr, M.Sweet: OpenGL. Księga eksperta, Helion, Gliwice 1999 2. Strona ARB/Khronos: http://www.opengl.org 3. K. Dempski: DirectX. Rendering w czasie rzeczywistym, Helion, Gliwice 4. 2003. J.Sanchez,M.Canton: Direct3D.Biblia, Helion, Gliwice2000 5. D.Wolff: OpenGL 4 Shading Language Cookbook - Third Edition, Packt Publishing 2018 6. R.Madsen, S.Madsen: OpenGL Game Development By Example, Packt Publishing 2016 7. P.Singh: OpenGL ES 3.0 Cookbook, Packt Publishing 2015 8. P.Lapinski: Vulkan Cookbook, Packt Publishing 2017
	Supplementary literature	No requirements
	eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	
Work placement	Not applicable