



Subject card

Subject name and code	Graphic Systems, PG_00067093						
Field of study	Informatics						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
Education level	second-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	Part-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Intelligent Interactive Systems -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mariusz Szwoch					
	Teachers	dr inż. Mariusz Szwoch					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	12.0	0.0	0.0	15.0	0.0	27
	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	27		8.0		65.0	100
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_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.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	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_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	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. Differentiates functions of particular shaders.	[SW1] Assessment of factual knowledge
Subject contents	Course content – lecture 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	basics of computer graphics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	51.0%	50.0%
	Laboratory	51.0%	50.0%
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		
Example issues/ example questions/ tasks being completed			
Practical activities within the subject	Not applicable		

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