GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Graphic Systems, PG_00067093		
Field of study	Informatics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
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 -> Wydziały Politechniki Gdańskiej		
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	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

<table>
<tr><td>Learning outcomes</td><td>
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<tr><th>Course outcome</th><th>Subject outcome</th><th>Method of verification</th></tr>
<tr><td>[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</td><td>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.</td><td>[SW1] Assessment of factual knowledge</td></tr>
<tr><td>[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</td><td>Student uses graphics libraries. Student creates graphic applications using OpenGL and Direct3D libraries.</td><td>[SU4] Assessment of ability to use methods and tools
[SU1] Assessment of task fulfilment</td></tr>
<tr><td>[K7_U07] can apply advanced methods of process and function support, specific to the field of study</td><td>Student uses graphics libraries. Student creates graphic applications using OpenGL and Direct3D libraries.</td><td>[SU4] Assessment of ability to use methods and tools
[SU1] Assessment of task fulfilment</td></tr>
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</td></tr>
<tr><td>Subject contents</td><td>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</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>basics of computer graphics</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>Laboratory</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>Exam</td><td>51.0%</td><td>50.0%</td></tr>
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</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>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</td></tr>
<tr><td>Supplementary literature</td><td>No requirements</td></tr>
<tr><td>eResources addresses</td><td></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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