GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Graphics Systems, PG_00048265		
Field of study	Informatics		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Optional subject group Specialty 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	1	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 -> 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	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_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_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_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_W04] knows and understands, to an increased extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or other elements or programmable devices specific to the field of study, and organization of work 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

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

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	

Example issues/ example questions/ tasks being completed

Practical activites within the subject	Not applicable

Document generated electronically. Does not require a seal or signature.