GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Introduction to computer graphics and computational geometry, PG_00069495						
Field of study	Mathematics						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2026/2027			
Education level	second-cycle studies		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	4.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Divison of Nonlinear Analysis -> Institute of Applied Mathematics -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Jakub Maksymiuk				
	Teachers		dr inż. Jakub Maksymiuk				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60		5.0	35.0		100
Subject objectives	The aim of the course is to familiarize students with selected topics of computer graphics and computational geometry.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U03] uses differential and integral calculus, elements of complex analysis, algebraic methods, applies them in typical practical	The student is able to apply methods of linear algebra, geometry, and analysis in solving computer graphics problems.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K7_W03] demonstrates knowledge advanced computation techniques, supporting the work of a mathematician and understand their limitations.	The student knows the basic problems, methods and algorithms of computer graphics and computational geometry.	[SW1] Assessment of factual knowledge
[K7_K02] formulates questions to deepen own understanding of a given topic or find missing elements of reasoning, understands the need to clearly present selected achievements of higher mathematics to laymen.	Based on a verbal description of the problem, the student is able to formulate a precise model, find and complete the missing elements, and describe the solution obtained.	[SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills
[K7_U09] constructs mathematical models used in specific advanced applications of mathematics, can use stochastic processes as a tool for modeling phenomena and analyzing their evolution,constructs mathematical models used in specific advanced applications of mathematics, uses stochastic processes as a tool for modeling phenomena and analyzing their evolution, recognizes mathematical structures in physical theories	The student is able to create and analyze basic algorithms used in computational geometry.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

Subject contents

Course content – lecture

1. Geometric transormations in 2D and 3D. Homogenoeus coordinates.
2. Projections in 2D and 3D.
3. Representation of curves and surfaces: Bezier, B-splain and NURBS.
4. Selected topics of rendering: colors, reflections, shading, ray tracing
5. Data structures in computer graphics.
6. Introduction to computational geometry.
7. Convex hull. Intersections of lines and poygons. Triangulation.
8. Voronoi diagrams. Delunay triangulation.

On the laboratory, students prepare programming projects related to selected topics discussed during the lecture.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project assignments	50.0%	100.0%

Recommended reading

Basic literature	1. D. Marsh, *Applied geometry for computer graphics and CAD,* Springer Science & Business Media, 2006 2. M. de Berg, O. Cheong, M. van Kreveld, M. Overmars, *Computational Geometry. Algorithms and Applications. Third Ed.*, Springer Science & Business Media 2008
Supplementary literature	brak
eResources addresses	

Example issues/ example questions/ tasks being completed

1. Using the PyGame library, write a program according to the given specification.

2. Propose algorithms that solve simple geometric problems.

3. Implement selected computational geometry algorithms and test the implementation.

Practical activites within the subject

Not applicable

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