



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 2025		Academic year of realisation of subject		2025/2026		
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	Division of Nonlinear Analysis -> Institute of Applied Mathematics -> Faculty of Applied Physics and Mathematics -> Wydział Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Jakub Maksymiuk				
	Teachers		dr inż. Jakub Maksymiuk				
Lesson types and methods of instruction	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						
	eNauczanie source addresses: Moodle ID: 45003 WdGKiGO [2025/26] https://enauzanie.pg.edu.pl/moodle/course/view.php?id=45003						
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_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.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	[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.	[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice
	[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_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.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
Subject contents	<div>1. Geometric transformations in 2D and 3D. Homogeneous coordinates.</div> <div>2. Projections in 2D and 3D.</div> <div>3. Representation of curves and surfaces: Bezier, B-spline and NURBS.</div> <div>4. Selected topics of rendering: colors, reflections, shading, ray tracing</div> <div>5. Data structures in computer graphics.</div> <div>6. Introduction to computational geometry.</div> <div>7. Convex hull. Intersections of lines and polygons. Triangulation.</div> <div>8. Voronoi diagrams. Delunay triangulation.</div> <div>On the laboratory, students prepare programming projects related to selected topics discussed during the lecture.</div>		
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	<div>1. D. Marsh, <i>Applied geometry for computer graphics and CAD</i>, Springer Science & Business Media, 2006</div> <div>2. M. de Berg, O. Cheong, M. van Kreveld, M. Overmars, <i>Computational Geometry. Algorithms and Applications. Third Ed.</i>, Springer Science & Business Media 2008</div>	
	Supplementary literature	brak	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<div>1. Using the PyGame library, write a program according to the given specification.</div> <div>2. Propose algorithms that solve simple geometric problems.</div> <div>3. Implement selected computational geometry algorithms and test the implementation.</div>		
Work placement	Not applicable		

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