



## Subject card

Subject name and code	Introduction to computer graphics and computational geometry, PG_00050169						
Field of study	Mathematics						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional 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			5.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Nonlinear Analysis and Statistics -> Faculty of Applied Physics and Mathematics						
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						
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		0.0		0.0	60
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_W04] Has enhanced knowledge of a selected branch of mathematics, theoretical or applied.	Student knows the basic methods and algorithms of computer graphics and computational geometry.			[SW1] Assessment of factual knowledge		
	[K7_U11] Can construct mathematical models used in specific advanced applications of mathematics, can use stochastic processes as a tool for modeling phenomena and analyzing their evolution.	Student can create and analyze basic algorithms.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		
	[K7_K02] Can precisely formulate 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.	The student is able to formulate a precise model based on a verbal description and explain its operation to colleagues.			[SK3] Assessment of ability to organize work [SK1] Assessment of group work skills		
[K7_U07] Can use algebraic methods (especially on linear algebra) when solving problems in various fields of mathematics and practical tasks.	Student is able to apply the methods of linear algebra and geometry in computer graphics.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment			

Subject contents	<ol style="list-style-type: none"> <li>1. Geometric transformations in 2D and 3D. Homogeneous coordinates.</li> <li>2. Projections in 2D and 3D.</li> <li>3. Representation of curves and surfaces: Bezier, B-spline and NURBS.</li> <li>4. Selected topics of rendering: colors, reflections, shading, ray tracing, clipping</li> <li>5. Data structures in computer graphics.</li> <li>6. Introduction to computational geometry.</li> <li>7. Convex hull. Intersections of lines and polygons. Triangulation.</li> <li>8. Voronoi diagrams. Delunay triangulation.</li> <li>9. Determining position. Range searching. Motion planning.</li> </ol>		
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	<ol style="list-style-type: none"> <li>1. D. Marsh, <i>Applied geometry for computer graphics and CAD</i>, Springer Science &amp; Business Media, 2006</li> <li>2. M. de Berg, O. Cheong, M. van Kreveld, M. Overmars, <i>Computational Geometry. Algorithms and Applications. Third Ed.</i>, Springer Science &amp; Business Media 2008</li> </ol>	
	Supplementary literature	brak	
	eResources addresses	Adresy na platformie eNauczanie: Wstęp do grafiki komputerowej i geometrii obliczeniowej [2023/24] - Moodle ID: 28410 <a href="https://enauzanie.pg.edu.pl/moodle/course/view.php?id=28410">https://enauzanie.pg.edu.pl/moodle/course/view.php?id=28410</a>	
Example issues/ example questions/ tasks being completed	Create an algorithm drawing a given shape using the given primitives.  Describe Bezier curves.  Propose and analyze the algorithm finding the points of intersection in the set of intervals.		
Work placement	Not applicable		