

Subject card

Subject name and code	Computer Graphics for Mathematicians, PG_00155346						
Field of study	Mathematical Modeling and Data Analysis						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	Master's studies		Subject group				
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		6.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Division of Geometry -> Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Michał Jabłonowski				
	Teachers		dr Michał Jabłonowski				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	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		10.0		80.0	150
Subject objectives	The aim is to present the knowledge and basic mathematical and IT tools used in computer graphics and needed to understand it; during laboratory exercises, the aim is to familiarize yourself with the Blender program, which will be used to complete a short math-related project for laboratory pass requirements.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[MMiADMU2_W05] knows and fully understands selected software packages or IT techniques used for symbolic calculations or for statistical data processing	The student knows and understands the Blender 3D graphics package.	[SW4] test/exam - oral or written
	[MMiADMU2_K04] is ready to understand and appreciate the importance of intellectual honesty in the actions of himself and others; is ready to act ethically	The student is ready to understand and appreciate the importance of intellectual honesty in his own and other people's actions; ethical conduct.	[SK8] observation of student's independent or team work
	[MMiADMU2_K02] is ready to precisely formulate questions to deepen his own understanding of a given topic or to find missing elements of reasoning	The student is ready to precisely formulate questions to deepen understanding of a given topic.	[SK1] oral statement/conversation/discussion
	[MMiADMU2_K01] is ready to recognize the limitations of his own knowledge and is ready to continue his education	The student knows the limitations of his or her own knowledge and understands the need for further education.	[SK8] observation of student's independent or team work
	[MMiADMU2_W04] knows and understands the theoretical basis of computational methods and IT techniques used to solve problems in a selected field of mathematics	The student has extended and deepened knowledge of mathematics regarding formulating and solving tasks/problems related to computer graphics.	[SW4] test/exam - oral or written
	[MMiADMU2_U06] is able to apply methods and examples from a selected field of mathematics in related fields	The student is able to prepare an animated, dynamic 3D scene showing or using a selected mathematical issue.	[SU2] presentation/project/paper/report [SU8] observation of student's independent or team work
	[MMiADMU2_U07] is able to define his interests and develop them; in particular, is able to establish contact with specialists in their field, e.g. understand their lectures intended for young mathematicians	The student has the opportunity and can do it. on a topic of your choice within your field of interest, create a computer visualization.	[SU1] oral statement/conversation/discussion [SU2] presentation/project/paper/report
	[MMiADMU2_U11] can evaluate, at a basic level, the usefulness of mathematical methods and IT tools	The student knows how to use at least one program for creating graphics and 3D animation related to the topic of his or her choice.	[SU6] demonstration of practical skills [SU8] observation of student's independent or team work
	[MMiADMU2_K05] is ready to independently search for information in literature, also in foreign languages	The student is able to independently search for information in the literature/Internet.	[SK1] oral statement/conversation/discussion [SK3] text preparation/written work
	[MMiADMU2_U05] is able to make proofs and analyzes in a given field, in which, if necessary, he also uses tools from other areas of mathematics	The student is able to analyze the correctness of the script generating the designated scene. Then it can save this scene as a movie in a given quality.	[SU2] presentation/project/paper/report
Subject contents	1. Modeling and modifying solids and surfaces, polygonal meshes. 2. Projections, view and camera movement. 3. Lighting models, shading methods. 4. Transformation matrices: scaling, shifts, rotations, reflections. 5. Material properties, texturing. 6. Applications of algebra in 3D graphics, including quaternions. 7. Interpolation curves, motion curves. 8. Animation using keyframes. 9. Rendering, ray tracing, sampling. Elements of physics simulation.		
Prerequisites and co-requisites	Linear algebra course.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	observation of the student's attitude	100.0%	0.0%
	project and its quality	51.0%	70.0%
	exam	51.0%	30.0%

Recommended reading	Basic literature	A.1. • S. Marschner and P. Shirley, Fundamentals of Computer Graphics, CRC Press 2022. • J. Blain, The complete guide to Blender Graphics. Computer Modeling & Animation , CRC Press 2021. A.2. • P. Chlipalski, Blender : architektura i projektowanie, Helion 2018. • F. Dunn and I. Parberry, 3D Math Primer for Graphics and Game Development, 2011.
	Supplementary literature	• S. Gortler, Foundations of 3D Computer Graphics, The MIT Press 2012. • B. Simonds, Blender : praktyczny przewodnik po modelowaniu, rzeźbieniu i renderowaniu, Helion 2014. • A. Brito, Blender 3. The beginners guide, 2022.
	eResources addresses	
Example issues/ example questions/ tasks being completed	n/a	
Work placement	Not applicable	

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