

Subject card

Subject name and code	Computer graphics for mathematicians, PG_00161250						
Field of study	Mathematics						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	postgraduate studies		Subject group		Optional 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				
Conducting unit	Zakład Geometrii -> Instytut Matematyki -> Faculty of Mathematics, Physics and Informatics -> Rektor						
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
	[MATMU2_U04] is able, at an advanced level and including modern mathematics, to apply and present, orally and in writing, methods of at least one selected branch of mathematics	Not applicable.	[SU8] observation of student's independent or team work
	[MATMU2_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.	[SK2] presentation/project/paper/ report
	[MATMU2_W03] knows and understands in-depth a selected field of theoretical or applied mathematics and is able to understand the formulations of issues in this field that are still at the research stage and knows the connections of issues in this field with other areas 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
	[MATMU2_K06] is ready to formulate opinions on basic mathematical issues	Not applicable.	[SK8] observation of student's independent or team work
	[MATMU2_U01] can construct mathematical reasoning: prove theorems and refute hypotheses through construction and selection of counterexamples	Not applicable.	[SU8] observation of student's independent or team work
	[MATMU2_K01] is willing to acknowledge the limitations of his or her own knowledge and is willing to pursue further education	The student is able to independently search for information in the literature/ Internet.	[SK8] observation of student's independent or team work
	[MATMU2_U05] can perform proofs in a selected field and, if necessary, also use tools from other areas of mathematics	Not applicable.	[SU8] observation of student's independent or team work
	[MATMU2_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. Then it can be saved as a movie in a given quality.	[SU2] presentation/project/paper/ report [SU6] demonstration of practical skills
	[MATMU2_K02] is ready to precisely formulate questions to deepen his/her understanding of a given topic or 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
	[MATMU2_W02] knows and understands well the role and importance of the construction of mathematical reasoning	Not applicable.	[SW1] oral statement/ conversation/discussion
	[MATMU2_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; ethical conduct	The student is ready to understand and appreciate the importance of intellectual honesty in his own and other people's actions; ethical conduct.	[SK1] oral statement/conversation/ discussion [SK8] observation of student's independent or team work
	[MATMU2_U03] can understand mathematical texts of various types from selected fields of mathematics	Not applicable.	[SU8] observation of student's independent or team work
	[MATMU2_U07] is able to define his/her interests and develop them; in particular, is able to establish contact with specialists in his/her field, e.g. understand their lectures intended for young mathematicians	Not applicable.	[SU8] observation of student's independent or team work
	[MATMU2_W01] knows and understands in-depth the theory of selected areas of mathematics	Not applicable.	[SW1] oral statement/ conversation/discussion

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	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	n/a		
Work placement	Not applicable		

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