



## Subject card

Subject name and code	, PG_00030017						
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	2	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Instytut Fizyki i Informatyki Stosowanej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Bartosz Reichel				
	Teachers		dr inż. Bartosz Reichel				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	45.0	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	Understanding the basics of graphics creation pipeline on computers, Learning basic operations and transformation (projection, rotation, filling, tessellation) Knowledge of basic libraries 3D (OpenGL, DirectX) Getting to know the Unity platform, to create a simple game.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U13] Understands the mathematical foundations of the analysis of algorithms and computational processes, can construct algorithms with good numerical properties, used to solve typical and unusual mathematical problems.	Ability to implement the algorithm eg. Calculating transparency in 3d graphics.	[SU1] Assessment of task fulfilment
	[K7_W12] Knows well at least one symbolic computation software package and one statistical data processing package.	Creating an application in the selected platform. Eg. Implementing collision algorithm in bouncing ball example	[SW1] Assessment of factual knowledge
	[K7_W05] Has enhanced knowledge of a selected branch of mathematics: knows most classical definitions and theorems and their proofs, Understands problems being examined, Knows relations between problems from particular field with other branches of mathematics, theoretical and applied	Use of knowledge in practice (task). Game (eg. Bollard) implementation	[SW3] Assessment of knowledge contained in written work and projects
[K7_K03] Can work as a team; understands the necessity of systematic work on all projects that are long-term in nature, understands and appreciates the importance of intellectual honesty in one's own activities and the activities of other people; behaves ethically.	Ability to work in a team. Using tools like git.	[SK2] Assessment of progress of work	
Subject contents	<ul style="list-style-type: none"> <li>- Display Process: how it works on simple graphics card</li> <li>- The process of creating 2D graphics</li> <li>- Bitmaps operations (Terenary raster Operations)</li> <li>- Collision in 2D systems</li> <li>- The process of creating 3D graphics</li> <li>- The importance of basic concepts in 3D graphics (eg camera) and elements associated with them</li> <li>- Shaders (basic)</li> <li>- Collisions in 3D</li> <li>- Physics engine libraries for games</li> <li>- Sound (playback, create / filtering)</li> <li>- Input-output devices (HID devices)</li> <li>- Use of platforms: OpenGL / DirectX, GDI +</li> <li>- Unity Platform.</li> </ul>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Implementation of tasks on the laboratory	50.0%	100.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> <li>• Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Andrew Troelsen, Apress</li> <li>• Graphics Gems (I-V), Academic Press</li> </ul>	
	Supplementary literature	Dave Calabrese, Unity 2D Game Development, March 2014, ISBN 139781849692564  or a similar from scope of Unity	
	eResources addresses	Adresy na platformie eNauczenie: Programowanie gier komputerowych 2024 - Moodle ID: 37427 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=37427">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=37427</a>	

Example issues/ example questions/ tasks being completed	Implement a simple 2D game (eg. PAC MAN)
Work placement	Not applicable