GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modern Programming Environments, PG_00053918		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
Education level	first-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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Tomasz Stefański	
	Teachers	dr hab. inż. Tomasz Stefański	

Lesson types and methods of instruction							
	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	4.0	41.0	75

Subject objectives	Introduce modern parallel-programming environments based on the example of the CUDA technology created by Nvidia.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W03] Knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	The student can write programs in C / C ++ languages that use graphics cards.	[SW1] Assessment of factual knowledge
	[K6_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	The student understands the principles of parallel programming and can write programs that use graphics cards.	[SW1] Assessment of factual knowledge
	[K6_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study	The student can write engineering programs in the CUDA environment.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	[K6_W01] Knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	The student can write programs that process large amounts of data in parallel.	[SW1] Assessment of factual knowledge
Subject contents	1. Introduction to the CUDA architecture and development environment. 2. Presentation of the compiler (nvcc), debugger (cuda-gdb) and profiler in CUDA. 3. Parallel programming model: kernels, threads, blocks of threads, memory hierarchy, heterogeneous programming, computing capabilities of graphics cards from NVIDIA. 4. CUDA C programming interface. 5. Code optimization. 6. Overview of programming libraries available in CUDA. 7. Introduction to OpenCL.		
Prerequisites and co-requisites	Student has a basic knowledge of programming.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	lecture	40.0%	20.0%
	laboratory	40.0%	30.0%
	project	40.0%	50.0%
Recommended reading	Basic literature	- CUDA C Programming Guide - CUDA Runtime API - CUDA C Best Practices Guide	
	Supplementary literature	- CUDA Compiler Driver NVCC - CUDA Visual Profiler - CUDA-gdb debugger - CUDA-memcheck memory checker	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	1. CUDA parallel programming model. 2. Memories on the graphics card. 3. The use of shared memory. 4. Streams in CUDA. 5. Events in CUDA.		
Work placement	Not applicable		