University of Gdańsk

Subject card

Subject name and code	Advanced Algorithms, PG_00203638		
Field of study	Informatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Master's studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr Maciej Dziemiańczuk	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	20.0	0.0	20.0	0.0	0.0	40

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	40	0.0	85.0	125

Subject objectives

The aim of the course is to familiarize students with basic techniques for designing parallel algorithms. Familiarizing students with English terminology.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFMU2_W11] knows and understands in depth the principles of designing and implementing complex software systems, the impact of system architecture on its concurrency, performance and scalability, concurrent and parallel processing models and their application in modern systems		
[INFMU2_W02] has in-depth knowledge of models of computation, and issues of computational complexity; is familiar with the formal apparatus for formulating and studying the properties of computer objects		
[INFMU2_U03] can design and analyze for correctness and computational complexity, and build algorithms using advanced programming techniques	Can assess the computational complexity of designed algorithms. Can design constant-time or logarithmic-time parallel algorithms for simple problems.	[SU4] test/exam - oral or written
[INFMU2_U05] can apply known algorithms in specific situations, can effectively select the type of algorithm depending on the problem at hand	Can design an algorithm utilizing techniques such as balanced tree, pointer jumping, tree contraction, and Eulerian cycle.	[SU4] test/exam - oral or written

Subject contents	1. PRAM model assumptions, potential conflicts and their resolution in PRAM sub-models; 2. Writing parallel algorithms; 3. Parameters of parallel algorithms; 4. Methods for designing parallel algorithms: balanced tree method, pointer jumping (algorithms on lists), divide and conquer, breaking symmetry, Eulerian cycle technique; 5. Selected algorithms: prefix sum algorithms, binary number addition, arithmetic expression tree evaluation, sorting, cycle coloring.
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
exam	51.0%	50.0%
tests	51.0%	50.0%

Recommended reading

Basic literature	1. Joseph Jaja, *An Introduction to Parallel Algorithms*, Addison-Wesley Publishing Company, 1992; 2. Selim Akl, *The Design and Analysis of Parallel Algorithms*, Prentice-Hall, 1989.
Supplementary literature	not applicable
eResources addresses	

Example issues/ example questions/ tasks being completed	not applicable
Work placement	Not applicable

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