University of Gdańsk

Subject card

Subject name and code	Advanced Algorithms, PG_00203707						
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	full-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 Janusz Dybizbański				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	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		0.0		65.0	125
Subject objectives	The aim of the course is to familiarize students with the basic techniques of designing parallel algorithms.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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	knows and understands the PRAM computational model and its application to the design and analysis of parallel algorithms can analyze and evaluate the computational complexity and work of parallel algorithms can analyze and compare parallel algorithms with respect to computational complexity, cost, and efficiency	[SW4] test/exam - oral or written
[INFMU2_U03] can design and analyze computational complexity and build algorithms	can design an algorithm using the balanced tree technique, pointer jumping, and Euler cycle can determine the computational complexity of the designed algorithms	[SU4] test/exam - oral or written
[INFMU2_W04] 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	knows and understands the PRAM model, its variants, and methods for resolving concurrent memory access conflicts can design parallel algorithms using the balanced tree technique, pointer jumping, and Euler tour techniques can select an appropriate parallel algorithm design technique for a given computational problem	[SW4] test/exam - oral or written
[INFMU2_U05] is able to effectively select the type of algorithm depending on the given problem, is able to apply algorithms using advanced information and communication techniques	can design an algorithm using the balanced tree technique, pointer jumping, and Euler cycle	[SU4] test/exam - oral or written [SU8] observation of student's independent or team work

Subject contents

- assumptions of the PRAM model, possible conflicts and their resolution in PRAM submodels
- two methods of writing parallel algorithms
- parameters of parallel algorithms
- parallel algorithm design methods:
  - balanced tree method,
  - pointer jumping,
  - divide-and-conquer,
  - symmetry breaking,
  - pipelinning,
  - Euler cycle technique,
- selected algorithms: arithmetic expression tree evaluation, minimum spanning tree, sorting, cycle coloring

Prerequisites and co-requisites

no requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
activity in classes	51.0%	5.0%
exam	51.0%	50.0%
tests	51.0%	45.0%

Recommended reading

Basic literature	[1] Joseph JaJa, An Introduction to Parallel Algorithms, Addison-Wesley, [2] Selim Akl, The Design and Analysis of Parallel Algorithms, Prentice-Hall. [3] Henri Casanova, Arnaud Legrand, Yves Robert, Parallel Algorithms, Chapman & Hall.
Supplementary literature	no applicable
eResources addresses	

Example issues/ example questions/ tasks being completed

no applicable

Work placement	Not applicable

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