University of Gdańsk

Subject card

Subject name and code	Advanced algorithms, PG_00155225		
Field of study	Informatics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
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	7.0
Learning profile	academic	Assessment form	
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	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	0.0	115.0	175

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_U03] designs, analyzes for correctness and computational complexity, and builds algorithms using advanced programming techniques and data structures	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_K01] knows the limits of his own knowledge and understands the need for further learning	the student can formulate opinions about parallel algorithms	[SK4] test/exam - oral or written
[INFMU2_K03] is able and ready to formulate opinions on basic IT issues	the student understands the need to develop his or her knowledge	[SK4] 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 using the balanced tree technique, pointer jumping, and Euler cycle	[SU4] test/exam - oral or written
[INFMU2_W04] knows complex data structures and advanced methods of algorithmic solution of computationally difficult problems (exponential algorithms, approximation, heuristics)	the student knows selected data structures used by parallel algorithms the student knows the techniques of designing parallel algorithms	[SW4] test/exam - oral or written

<table>
<tr><td>Subject contents</td><td>
• 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
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<tr><td>Prerequisites and co-requisites</td><td>no requirements</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>tests</td><td>51.0%</td><td>45.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>activity in classes</td><td>0.0%</td><td>5.0%</td></tr>
</table>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>[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.</td></tr>
<tr><td>Supplementary literature</td><td>no applicable</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>no applicable</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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