University of Gdańsk

Subject card

Subject name and code	Algorithms and Data Structures, PG_00198507		
Field of study	Informatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	Bachelor'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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Anna Nenca	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	20.0	0.0	30.0	0.0	0.0	50

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	50	0.0	75.0	125

Subject objectives

Familiarizing students with classical algorithms and data structures used to effectively solve typical programming tasks, justifying the correctness of the algorithms learned, and analyzing the time complexity of these algorithms

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFOL3_W03] knows and understands advanced concepts in the field of algorithms and data structures, formal languages, automata theory and computational complexity, and artificial intelligence	knows and understands classical data structures (lists, stacks, trees, hash tables, balanced trees) and operations on them knows selected sorting algorithms knows facts about the time complexity of sorting, search, insertion, and deletion algorithms	[SW4] test/exam - oral or written
[INFOL3_U02] is able to use his/her knowledge of higher mathematics to model and solve complex problems	Is able to analyze the computational complexity of algorithms and use mathematical methods to assess the correctness and effectiveness of proposed solutions.	[SU4] test/exam - oral or written
[INFOL3_U06] is able to select and apply appropriate IT methods and tools to solve complex problems, is able to use acquired knowledge by appropriately selecting sources and information derived from them, and perform evaluation, critical analysis, and synthesis of this information	Is able to select appropriate algorithms and data structures to solve complex IT problems and justify the choice made taking into account computational efficiency. Is able to implement, test and compare various algorithmic solutions using appropriate programming tools.	[SU4] test/exam - oral or written [SU5] implementation of a problem task

<table>
<tr><td>Subject contents</td><td>Introductory concepts: semantic correctness, pessimistic and expected time complexity, asymptotic complexity notation. • Comparison sorting. Algorithms with quadratic complexity, linear-logarithmic complexity (heapsort), and average linear-logarithmic complexity (quicksort). • Lower bound theorems for pessimistic and expected time complexity for sorting algorithms. • Linear-time sorting. • Basic data structures: lists, stacks, queues, priority queues. Implementations using arrays and link structures. • Data structures for dictionary operations (insert, delete, search): hash tables, binary search trees. • Methods for constructing efficient algorithms: divide-and-conquer, dynamic programming (longest common subsequence), greedy algorithms (Huffman codes). • Searching for a pattern in the text</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Programming skills; knowledge of mathematical apparatus at the level of a lecture in discrete mathematics</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>implementation task</td><td>51.0%</td><td>5.0%</td></tr>
<tr><td>test</td><td>51.0%</td><td>45.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein -- Introduction to algorithms, Wydawnictwo Naukowe PWN 2012.</td></tr>
<tr><td>Supplementary literature</td><td>L. Banachowski, K. Diks, W. Rytter -- Algorithms and data structures, Publishing House Scientific PWN 2018</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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