University of Gdańsk

Subject card

Subject name and code	Algorithms and Data Structures p.1, PG_00143491		
Field of study	Informatics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	7.0
Learning profile	academic	Assessment form	exam
Conducting unit	Institute of Informatics -> Faculty of Mathematics, Physics and Informatics -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Paweł Pączkowski	
	Teachers	dr inż. Kamila Mazur-Oleszczuk dr Janusz Dybizbański dr Paweł Pączkowski	

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	115.0	175

Subject objectives

To familiarize students with classical algorithms and data structures used to effectively solve typical programming tasks, methods of implementing the studied algorithms, analysis of the time complexity of these algorithms and justification of their correctness.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFL3_U03] can design and analyze algorithms for their correctness and computational complexity using appropriate algorithmic techniques and data structures	can explain, using an example, the operation of selected classical algorithms can provide definitions of selected commonly used data structures and illustrate them with an example (stacks, queues, heaps, trees, hash tables) can program the studied algorithms using their description in the form of pseudocode	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written [SU5] implementation of a problem task
[INFL3_U02] can precisely formulate questions to deepen one's understanding of a given topic or find missing elements of reasoning	can formulate statements about algorithms and data structures and understands the need for further education	[SU8] observation of student's independent or team work
[INFL3_W03] has structured, theoretically grounded general knowledge in the field of algorithms and data structures, formal languages, automata theory and computational complexity, and artificial intelligence	knows classical data structures (lists, stacks, trees, hash tables) and operations on these structures knows selected effective sorting algorithms knows facts about the time complexity of sorting, searching, inserting and deleting algorithms	[SW4] test/exam - oral or written

Subject contents

- Introductory concepts: semantic correctness, pessimistic and expected time complexity, asymptotic notation
- Sorting by comparison. Algorithms with quadratic complexity, linear-logarithmic complexity (heapsort), and expected linear-logarithmic complexity (quicksort). Lower bound on pessimistic and expected time complexity.
- Linear time sorting
- The selection problem
- Basic data structures: lists, stacks, queues, priority queues. Implementations using arrays and link structures.
- Data structures for insertion, deletion and searching: hash tables, binary search trees, balanced trees (red-black trees)
- Amortized cost analysis

Prerequisites and co-requisites

Discrete Mathematics, Programming Languages

Programming skills, knowledge of mathematical apparatus at the level of a Discrete Mathematics lecture

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
programs and tests assessed in laboratories	40.0%	50.0%
written exam	40.0%	50.0%

Recommended reading

Basic literature	• T. H. Cormen, C. E. Leiserson , R. L. Rivest, C. Stein, Wprowadzenie do algorytmów, Wydawnistwo Naukowe PWN 2012. • L. Banachowski, K. Diks, W. Rytter, Algorytmy i struktury danych, WNT 2011.
Supplementary literature	no recommendations
eResources addresses	

Example issues/ example questions/ tasks being completed

will be given during the lecture

Work placement

Not applicable

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