University of Gdańsk

Subject card

Subject name and code	Algorithms and data structures, PG_00143980		
Field of study	Informatics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	5.0
Learning profile	practical	Assessment form	
Conducting unit	Instytut Informatyki -> Faculty of Mathematics, Physics and Informatics -> Rektor		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Anna Nenca	
	Teachers	dr inż. Kamila Mazur-Oleszczuk dr inż. Anna Nenca dr hab. Paweł Żyliński	

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	Familiarizing 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_U01] can apply mathematical knowledge to formulate, analyse and solve tasks related to computer science, design and analyze algorithms in terms of their correctness and computational complexity	can explain, using an example, the operation of selected classical algorithms can give definitions of selected commonly used data structures and illustrate them with examples (stacks, queues, heaps, trees, hash tables)	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[INFL3_U08] assesses the usefulness of various paradigms and related programming tools to solve various types of problems	can program the studied algorithms based on their description in the form of pseudocode	[SU1] oral statement/conversation/ discussion [SU5] implementation of a problem task
[INFL3_K02] can precisely formulate questions to deepen his/ her own understanding of a given topic or to find missing elements of reasoning	can formulate statements on algorithms and data structures and understands the necessity of further education	[SK5] implementation of a problem task [SK8] observation of student's independent or team work
[INFL3_W04] has ordered, theoretically founded knowledge in programming, algorithms and complexity, programming languages and paradigms	knows classical data structures (letters, stacks, trees, tables with hashing) and operations on them knows selected effective sorting algorithms knows the facts about time complexity of sorting algorithms as well as algorithms for searching, inserting and deleting in selected data structures	[SW4] test/exam - oral or written

Subject contents

- Introductory concepts: semantic correctness, pessimistic and expected time complexity, asymptotic time complexity 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
- Basic data structures: lists, stacks, queues, priority queues. Implementations using arrays and linked structures
- Data structures for insertion, deletion and searching and time complexity of these operations: hash tables, binary search trees, balanced trees
- Strategies for creating effective algorithms: divide and conquer, dynamic programming, greedy strategy - presented using examples
- Amortized cost analysis

Prerequisites and co-requisites

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

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
exam	40.0%	50.0%
programs (70%) and tests (30%) in laboratories	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	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

to be given during lectures

Work placement

Not applicable

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