GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Algorithms and data structures, PG_00060216						
Field of study	Technical Physics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
Education level	first-cycle studies		Subject group		Optional subject group 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	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Division of Theoretical Physics and Quantum Informaton -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. arch. Jan Kozicki				
	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	5.0	60.0	125

Subject objectives	Learning the theoretical knowledge with some practical aspects of algorithms and data structure.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U01] learns independently, obtains information from literature, databases and other properly selected sources	Can study independently, gaining knowledge from literature and using appropriate sources	[SU2] Assessment of ability to analyse information
	[K6_W05] has knowledge of programming methodology and techniques, and the use of selected IT tools in physics and technology	Has basic knowledge of programming methodology and techniques.	[SW1] Assessment of factual knowledge
	[K6_U03] knows programming languages and can use basic software packages	Has the ability to program in the selected language.	[SU1] Assessment of task fulfilment
	[K6_K01] understands the need to learn and improve professional and personal competencies, inspires and organizes other people's learning process	Understands the need for lifelong learning and the need to improve competences.	[SK5] Assessment of ability to solve problems that arise in practice

| Subject contents | Course content – lecture
1. Growth of functions- asymptotic notation and standard notations and common functions
2. Recurrences- the subsittution method and the iteration method
3. The master method
4. Tables
5. Hash tables- hash functions and open addressing
6. Hash functions and open addressing
7. Heapsort- heaps, maintaining the heap property, building a heap, the heapsort algorith and priority queues
8. Quicsort- description, performance, randomized versions and analysis of quicksort
9. Elementary date structures- stacks and queues and linked lists
10. Trees
11. Binary search trees- what is a binary search tree, quering a binary searcg tree, insertion and deletion
12. Balanced trees
13. String Matching- the naive string-matching algorithm and the rabin-Karp algorithm
14. String matching with finite automata and the Knuth-Morris-Pratt algorithm
15. The Boyer-Moore algorithm |
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Prerequisites and co-requisites	Taking courses in mathematical analisys, algebra and discrete mathematic.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	56.0%	50.0%
	Written examination	56.0%	50.0%

Recommended reading	Basic literature	T. H. Cormen, Ch. E. Leiserson, R. L. Rivest, Introduction to algorithms, The MIT Press, Cambridge, 1990 K. Goczyła, Struktury danych, Wydawnictwo PG, Gdańsk 2002
	Supplementary literature	D. Harel, rzecz o istocie informatyki, Algorytmika, Wydawnictwo naukowo-Techniczne, Warszawa 2001D. Harel, Y. feldman, Algorithmics. The Spirit of Computing, Addison-Wesley, 2004
	eResources addresses	

Example issues/ example questions/ tasks being completed	What is an asymptotic notation? Standard notation and growth of functions Solving of recurrence equations. Pseudocodes, the rules. Executing chosen sorting algorithms. Building string matching algorithms with finite automata.
Practical activites within the subject	Not applicable

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