



Subject card

Subject name and code	Algorithms and data structures, PG_00060216						
Field of study	Technical Physics						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2024/2025		
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	Katedra Fizyki Teoretycznej i Informatyki Kwantowej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Józef Sienkiewicz					
	Teachers						
Lesson types and methods of instruction	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] Can learn independently, obtain information from literature, databases and other properly selected sources.	Can learn independently, drawing knowledge from literature, relying on appropriate sources.			[SU2] Assessment of ability to analyse information		
	[K6_K01] Understands the need to learn and improve professional and personal competencies. Can inspire and organize other people's learning process	Understands the need for lifelong learning and improving professional and personal competencies.			[SK2] Assessment of progress of work		
	[K6_U03] Knows programming languages and can use basic software packages	Has programming skills in the selected language.			[SU1] Assessment of task fulfilment		
	[K6_W05] Has knowledge of programming methodology and techniques, and the use of selected IT tools in physics and technology.	Knowledge of programming methodology, techniques, and using selected IT tools in physics and technology.			[SW1] Assessment of factual knowledge		
Subject contents	1. Growth of functions- asymptotic notation and standard notations and common functions 2. Recurrences- the substitution 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 algorithm and priority queues 8. Quicksort- description, performance, randomized versions and analysis of quicksort 9. Elementary data structures- stacks and queues and linked lists 10. Trees 11. Binary search trees- what is a binary search tree, quering a binary search 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						

Prerequisites and co-requisites	Taking courses in mathematical analysis, algebra and discrete mathematic.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written examination	50.0%	50.0%
	Practical exercise	50.0%	50.0%
Recommended reading	Basic literature	T. H. Cormen, Ch. E. Leiserson, R. L. Rivest, Introduction to algorithms, The MIT Press, Cambridge, 1990 D. Harel, rzecz o istocie informatyki, Algorytmika, Wydawnictwo naukowo-Techniczne, Warszawa 2001 K. Goczyła, Struktury danych, Wydawnictwo PG, Gdańsk 2002 D. Harel, Y. Feldman, Algorithmics. The Spirit of Computing, Addison-Wesley, 2004	
	Supplementary literature	-	
	eResources addresses	Adresy na platformie eNauczenie:	
Example issues/ example questions/ tasks being completed	<p>What is an asymptotic notation?</p> <p>Standard notation and growth of functions</p> <p>Solving of recurrence equations.</p> <p>Pseudocodes, the rules.</p> <p>Executing chosen sorting algorithms.</p> <p>Building string matching algorithms with finite automata.</p>		
Work placement	Not applicable		

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