



Subject card

Subject name and code	Algorithms and data structures, PG_00020768						
Field of study	Technical Physics						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2021/2022		
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			6.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Theoretical Physics and Quantum Information -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Józef Sienkiewicz					
	Teachers	dr hab. inż. arch. Jan Kozicki prof. dr hab. Józef Sienkiewicz					
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						
	Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17703 Adresy na platformie eNauczanie:						
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	15.0		75.0		150
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_K01	Understands the need for lifelong learning and the need to improve competencies.			[SK5] Assessment of ability to solve problems that arise in practice		
	K6_W05	Has a basic understanding of methodology and techniques of writing computer programs.			[SW1] Assessment of factual knowledge		
	K6_U03	Has the ability programming in a selected language			[SU1] Assessment of task fulfilment		
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, querying 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 mathematics.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	50.0%	50.0%
	Written examination	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		
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.		
Work placement	Not applicable		