



Subject card

Subject name and code	Algorithms and data structures, PG_00020768						
Field of study	Technical Physics						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2022/2023		
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			English Lecture: English Laboratory: 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. Andrew Felt					
	Teachers	prof. Andrew Felt dr hab. inż. arch. Jan Kozicki					
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		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 competences.		[SK5] Assessment of ability to solve problems that arise in practice		
	K6_W05		Has basic knowledge of programming methodology and techniques.		[SW1] Assessment of factual knowledge		
	K6_U03		Has the ability to program in the selected language.		[SU1] Assessment of task fulfilment		

Subject contents	1. Growth of functions- asymptotic notation and standard notations and common functions 2. Recurrences 3. The master method 4. Stacks, queues, and linked lists 5. Priority queues/heaps 6. Hash tables- hash functions and open addressing 7. Heapsort 8. Quicksort- description, performance, randomized versions and analysis of quicksort 9. Trees 10. Binary search trees- what is a binary search tree, querying a binary search tree, insertion and deletion 11. Balanced trees 12. String Matching- the naive string-matching algorithm and the Rabin-Karp algorithm 13. String matching with finite automata and the Knuth-Morris-Pratt algorithm 14. The Boyer-Moore algorithm											
Prerequisites and co-requisites	Taking courses in mathematical analysis, algebra and discrete mathematics.											
Assessment methods and criteria	<table border="1" data-bbox="456 922 1482 1048"> <thead> <tr> <th data-bbox="456 922 794 958">Subject passing criteria</th> <th data-bbox="794 922 1145 958">Passing threshold</th> <th data-bbox="1145 922 1482 958">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 958 794 1012">Written examinations and participation</td> <td data-bbox="794 958 1145 1012">56.0%</td> <td data-bbox="1145 958 1482 1012">50.0%</td> </tr> <tr> <td data-bbox="456 1012 794 1048">Practical exercise</td> <td data-bbox="794 1012 1145 1048">56.0%</td> <td data-bbox="1145 1012 1482 1048">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Written examinations and participation	56.0%	50.0%	Practical exercise	56.0%	50.0%
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Recommended reading	Basic literature Supplementary literature eResources addresses	T. H. Cormen, Ch. E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd Ed., The MIT Press, Cambridge, 2009 Pat Morin, Open Data Structures: an Introduction, AU Press, Edmonton, AB, 2013. (open-source text) D. Harel, rzecz o istocie informatyki, Algorytmika, Wydawnictwo naukowo-Techniczne, Warszawa 2001 D. Harel, Y. Feldman, Algorithmics. The Spirit of Computing, Addison-Wesley, 2004 Adresy na platformie eNauczenie:										
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											