



## Subject card

Subject name and code	Algorithms and data structures, PG_00045360						
Field of study	Data Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2021/2022		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study 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	1	Language of instruction			English		
Semester of study	2	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Algorithms and Systems Modelling -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Krzysztof Manuszewski					
	Teachers	dr inż. Tytus Pikies mgr inż. Tomasz Goluch mgr inż. Robert Ostrowski mgr inż. Kacper Wereszko dr inż. Krzysztof Manuszewski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	15.0	0.0	60
	E-learning hours included: 0.0						
	Algorithms and Data Structures 2022 - Moodle ID: 22450 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22450">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22450</a>						
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	10.0		55.0	125	
Subject objectives	The aim of the course is to introduce students to algorithms and data structures. The basic and advanced data structures are presented as well as basic algorithms for selected domains. This will be followed by basics approaches to algorithm design.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W06] Knows the criteria and concepts of artificial intelligence, understands the operation of algorithms for intelligent computing, the concept of descriptive logic, combinatorial optimization algorithms, methods of construction, analysis and evaluation of algorithms, including discrete ones and problems of resolving conflicts in non-algorithmic decision making.	Student knows the methods of construction and evaluation of algorithm. Student is able to chose algorithm for particular problem			[SW1] Assessment of factual knowledge		
	[K6_U03] analyses problems and creates appropriate models, data structures and algorithms (including heuristic and numerical ones), assesses their computational complexity, estimates errors of the received solutions	Student is able to analyze problems and create valid models. Student knows basic data structures and is able to understand and implement algorithms with various complexity. Student understands idea of exact and aproximation algoritm. Student knows the idea of computational complexity			[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>Schema of problem solution: analysis of situation and analysis of goal. Algorithmic problems, algorithms notation, analysis, correctness, stop.</p> <p>Estimation of function growth. O notation, time vs. complexity. Examples if recursion/iteration, recursive and iterative algorithms</p> <p>Examples of recursion for algorithms based on strategy divide and conquer</p> <p>Basic data structures: list, queue, stack and methods of their realization</p> <p>Tables with hashing</p> <p>Simple sorting algorithms: insertion, selection, change. Quick and heap sort. Bucket sort and positional sort. Search for k-th minimal element</p> <p>Binary search trees, "Red-black" trees, B-Trees</p> <p>Joinable heaps.</p> <p>Basic approaches for algorithms design.</p> <p>Decision trees traversing.</p>														
Prerequisites and co-requisites	Introduction to programming course														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 1021 794 1048">Subject passing criteria</th> <th data-bbox="799 1021 1137 1048">Passing threshold</th> <th data-bbox="1142 1021 1481 1048">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1055 794 1081">project exercises</td> <td data-bbox="799 1055 1137 1081">40.0%</td> <td data-bbox="1142 1055 1481 1081">33.0%</td> </tr> <tr> <td data-bbox="456 1088 794 1115">exam</td> <td data-bbox="799 1088 1137 1115">40.0%</td> <td data-bbox="1142 1088 1481 1115">34.0%</td> </tr> <tr> <td data-bbox="456 1122 794 1149">laboratories</td> <td data-bbox="799 1122 1137 1149">40.0%</td> <td data-bbox="1142 1122 1481 1149">33.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	project exercises	40.0%	33.0%	exam	40.0%	34.0%	laboratories	40.0%	33.0%
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Recommended reading	Basic literature	T. Cormen, Introduction to Algorithms, The MIT Press 2009													
	Supplementary literature	<a href="http://www.algorytm.org/">http://www.algorytm.org/</a>													
	eResources addresses														
Example issues/ example questions/ tasks being completed	<p>Sample issues:</p> <p>LAB: implementation of recursive and iterative algorithms, implementation of basic sort methods, hash tables. Solving of knapsack problem.</p> <p>PROJ: implementation of ONP calculator for string operations, implementation of MinMax algorithm for simple game.</p>														
Work placement	Not applicable														