



Subject card

Subject name and code		Algorithms and data structures, PG_00045360						
Field of study		Data Engineering						
Date of commencement of studies		October 2022	Academic year of realisation of subject			2022/2023		
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 hab. inż. Robert Janczewski dr Marcin Jurkiewicz 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 & Data Structures 2022/23 - Moodle ID: 29735 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29735						
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_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 approximation algorithm. Student knows the idea of computational complexity		[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
		[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		

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" data-bbox="450 1012 1489 1151"> <thead> <tr> <th data-bbox="450 1012 794 1048">Subject passing criteria</th> <th data-bbox="794 1012 1139 1048">Passing threshold</th> <th data-bbox="1139 1012 1489 1048">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="450 1048 794 1084">exam</td> <td data-bbox="794 1048 1139 1084">40.0%</td> <td data-bbox="1139 1048 1489 1084">34.0%</td> </tr> <tr> <td data-bbox="450 1084 794 1120">project exercises</td> <td data-bbox="794 1084 1139 1120">40.0%</td> <td data-bbox="1139 1084 1489 1120">33.0%</td> </tr> <tr> <td data-bbox="450 1120 794 1151">laboratories</td> <td data-bbox="794 1120 1139 1151">40.0%</td> <td data-bbox="1139 1120 1489 1151">33.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	exam	40.0%	34.0%	project exercises	40.0%	33.0%	laboratories	40.0%	33.0%
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Recommended reading	Basic literature	T. Cormen, Introduction to Algorithms, The MIT Press 2009													
	Supplementary literature	http://www.algorytm.org/													
	eResources addresses	Podstawowe https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29735 - course on e-nauczanie													
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														