



## Subject card

Subject name and code	Algorithms and Data Structures, PG_00047652						
Field of study	Informatics						
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		Polish		
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. Krzysztof Manuszewski  mgr inż. Tomasz Goluch  dr Marcin Jurkiewicz  dr inż. Paweł Kowalski				
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						
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	Major goal is introduction to algorithms and data structures. During the course there are presented some basic data structures and basic algorithms from various domains. Presented are tree data structures, hash tables, balanced trees, B-trees and joinable heaps. During the course there are presented basic ideas about construction of algorithms.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U43] can analyse data and formulate, apply and assess appropriate formal models and algorithms for solving problems in the field of information systems and applications	knowledge about basic data structures, ability to understanding and implementation algorithms of various complexity,	[SU1] Assessment of task fulfilment
	[K6_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	skills in areas of problem analysis and model creation,	[SU1] Assessment of task fulfilment
	[K6_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study	knowledge about basic data structures and dedicated algorithms, ability to understanding and implementation algorithms of various complexity,	[SU1] Assessment of task fulfilment
	[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn	Student knows the idea of precise and approximated algorithm. Student is able to adapt algorithm to the problem constraints	[SU1] Assessment of task fulfilment
	[K6_W41] Knows and understands, to an advanced extent, the operation and evaluation criteria of data processing, storage and transfer methods, including computational algorithms, artificial intelligence and data mining	student understands how to evaluate algorithm and has understanding the complexity idea. Student knows basic data structures and algorithms. Student knows the basic methods for algorithms construction	[SW1] Assessment of factual knowledge

Subject contents	Schema of problem solution: analysis of situation and analysis of goal, impact of model on solution		
	Algorithmic problems, algorithms notation, analysis, correctness, stop,		
	Estimation of function growth, O notation, time vs. complexity		
	Examples if recursion/iteration, recursive and iterative algorithms		
	Brute-force method, heuristic method, Dynamic programming		
	Examples of recursion for algorithms based on strategy divide and conquer		
	Basic data structures (list, queue, stack) and methods of their realization		
	Simple sorting algorithms: insertion, selection, change. Binary search		
	Sorting algorithms based on strategy divide and conquer		
	Heap sort, Bucket sort and positional sort, , Search for $k$ -th minimal element		
	Adressing and hashing functions, Trees and algorithms for trees: BFS, DFS, Elementary graph algorithms		
	Binary search trees, priority queues, "Red-black" trees, B-Trees,		
	Graph representation, the shortest path in graphs: Dijkstra, Spanning tree in graphs: Prim and Kruskal algorithms		
	Prerequisites and co-requisites	Knowledge about fundamentals of programming	
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		40.0%	34.0%
		40.0%	33.0%
		40.0%	33.0%
Recommended reading	Basic literature	T. Cormen, Introduction to algorithms, MIT 1994	
	Supplementary literature	<a href="http://www.algorytm.org/">http://www.algorytm.org/</a>	
	eResources addresses	Adresy na platformie eNauczanie: Algorytmy i Struktury Danych 2022_23 - Moodle ID: 29684 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=29684">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=29684</a>	
Example issues/ example questions/ tasks being completed	LAB: implementation of iterative and recursive approaches, implementation of simple sorting methods, hash tables solution for knapsack problem  PROJ: Implementation ONP based calculator for string operations. implementation MInimax for simple games		
Work placement	Not applicable		