



Subject card

Subject name and code	Algorithms and Data Structures, PG_00047652						
Field of study	Informatics						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
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 Marcin Jurkiewicz dr inż. Krzysztof Manuszewski mgr inż. Tomasz Goluch mgr inż. Robert Ostrowski mgr inż. Andrzej Jastrzębski					
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_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_W44] knows and understands, to an advanced extent, architecture, design principles and methods of hardware and software support for local and distributed information systems, including computing systems, databases, computer networks and information applications, as well as the principles of human-computer interaction, the operation and evaluation criteria of data processing, storage and transfer methods, including computational algorithms, artificial intelligence and data mining as well as standards and methods of IT systems administration, monitoring of processes and robustness to undesirable phenomena and activities	Skills in algorithm analysis	[SU1] Assessment of factual knowledge
	[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

Subject contents	<p>Schema of problem solution: analysis of situation and analysis of goal, impact of model on solution</p> <p>Algorithmic problems, algorithms notation, analysis, correctness, stop,</p> <p>Estimation of function growth, O notation, time vs. complexity</p> <p>Examples if recursion/iteration, recursive and iterative algorithms</p> <p>Brute-force method, heuristic method, Dynamic programming</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>Simple sorting algorithms: insertion, selection, change. Binary search</p> <p>Sorting algorithms based on strategy divide and conquer</p> <p>Heap sort, Bucket sort and positional sort, , Search for k-th minimal element</p> <p>Addressing and hashing functions, Trees and algorithms for trees: BFS, DFS, Elementary graph algorithms</p> <p>Binary search trees, priority queues, "Red-black trees, B-Trees,</p> <p>Graph representation, the shortest path in graphs: Dijkstra, Spanning tree in graphs: Prim and Kruskal algorithms</p>														
Prerequisites and co-requisites	Knowledge about fundamentals of programming														
Assessment methods and criteria	<table border="1" data-bbox="450 1296 1489 1435"> <thead> <tr> <th data-bbox="450 1296 798 1332">Subject passing criteria</th> <th data-bbox="804 1296 1141 1332">Passing threshold</th> <th data-bbox="1147 1296 1489 1332">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="450 1341 798 1368"></td> <td data-bbox="804 1341 1141 1368">40.0%</td> <td data-bbox="1147 1341 1489 1368">33.0%</td> </tr> <tr> <td data-bbox="450 1377 798 1404"></td> <td data-bbox="804 1377 1141 1404">40.0%</td> <td data-bbox="1147 1377 1489 1404">34.0%</td> </tr> <tr> <td data-bbox="450 1413 798 1435"></td> <td data-bbox="804 1413 1141 1435">40.0%</td> <td data-bbox="1147 1413 1489 1435">33.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade		40.0%	33.0%		40.0%	34.0%		40.0%	33.0%
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Recommended reading	Basic literature	T. Cormen, Introduction to algorithms, MIT 1994													
	Supplementary literature	http://www.algorytm.org/													
	eResources addresses	Adresy na platformie eNauczanie:													
Example issues/ example questions/ tasks being completed	<p>LAB: implementation of iterative and recursive approaches, implementation of simple sorting methods, hash tables solution for knapsack problem</p> <p>PROJ: Implementation ONP based calculator for string operations. implementation MInimax for simple games</p>														
Work placement	Not applicable														

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