GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Algorithms and data structures, PG_00045360		
Field of study	Data Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2023/2024
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 Marcin Jurkiewicz mgr inż. Tomasz Goluch mgr inż. Robert Ostrowski mgr inż. Andrzej Jastrzębski 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

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 aproximation algoritm. Student knows the idea of computational complexity	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
[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

<table>
<tr><td>Subject contents</td><td>Schema of problem solution: analysis of situation and analysis of goal. Algorithmic problems, algorithms notation, analysis, correctness, stop.

Estimation of function growth. O notation, time vs. complexity. Examples if recursion/iteration, recursive and iterative algorithms

Examples of recursion for algorithms based on strategy divide and conquer

Basic data structures: list, queue, stack and methods of their realization

Tables with hashing

Simple sorting algorithms: insertion, selection, change. Quick and heap sort. Bucket sort and positional sort. Search for k-th minimal element

Binary search trees, "Red-black trees, B-Trees

Joinable heaps.

Basic approaches for algorithms design.

Decision trees traversing.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Introduction to programming course</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>exam</td><td>40.0%</td><td>34.0%</td></tr>
<tr><td>project exercises</td><td>40.0%</td><td>33.0%</td></tr>
<tr><td>laboratories</td><td>40.0%</td><td>33.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>T. Cormen,Introduction to Algorithms, The MIT Press 2009</td></tr>
<tr><td>Supplementary literature</td><td>http://www.algorytm.org/</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Algorithms & Data Structures 23/24 - Moodle ID: 37872
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37872</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Sample issues:

LAB: implementation of recursive and iterative algorithms, implementation of basic sort methods, hash tables. Solving of knapsack problem.

PROJ: implementation of ONP calculator for string operations, implementation of MinMax algorithm for simple game.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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