

Subject card

Subject name and code	Algorithms and Data Structures, PG_00204257						
Field of study	Mathematics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2026/2027		
Education level	Master's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	1		ECTS credits		4.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Błażej Szepietowski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	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		2.0		38.0	100
Subject objectives	The aim of the course is to familiarize the student with selected algorithms and data structures, methods of proving the correctness and determining the time complexity of algorithms, constructing effective algorithms.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[MATMU2_U04] is able to apply the scientific method in solving advanced problems in a selected branch of mathematics or its applications, and appropriately selects methods and tools - mathematical or computer - needed to solve such problems		The student is able to select appropriate methods and IT tools necessary to analyze the problem under consideration.		[SU2] presentation/project/paper/report		
	[MATMU2_W03] knows and understands to a deep degree a selected field of theoretical or applied mathematics and is able to understand the formulations of issues in this field that are still at the research stage and knows the connections between issues in this field and other areas of mathematics		The student knows the subject and is able to express ideas using its terminology.		[SW2] presentation/project/paper/report		
	[MATMU2_U09] is able to lead a team, cooperate with team members within its work, take the initiative in team management		is able to collaborate within a team in the design, implementation, and analysis of algorithms and data structures, taking initiative in organizing the team's work and task allocation during group programming projects		[SU2] presentation/project/paper/report		

Subject contents	1. Selected data structures and their implementations. 2. Analysis of algorithms, time complexity. 3. Sorting by comparison. Lower bound on the pessimistic time complexity. 4. Binary heaps and their applications. Priority queue. 5. Sorting in linear time. 6. Data structures for dictionary operations (insert, delete, search): hash tables, binary search trees, red-black trees, B-trees. 7. Methods of constructing effective algorithms: divide and conquer, dynamic programming, greedy strategy. 8. English nomenclature of the course		
Prerequisites and co-requisites	Knowledge of the concepts of limit of a sequence, sum of a series, expected value of a discrete random variable, knowledge of the basics of programming.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	projects	51.0%	100.0%
Recommended reading	Basic literature	1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, Introduction to algorithms, 2022.	
	Supplementary literature	1. L. Banachowski, K. Diks, W. Rytter, Algorytmy i struktury danych, PWN 2018	
	eResources addresses		
Example issues/ example questions/ tasks being completed	not included		
Work placement	Not applicable		

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