



Subject card

Subject name and code	Data structure , PG_00070037						
Field of study	InfoBioChem						
Date of commencement of studies	February 2027		Academic year of realisation of subject			2027/2028	
Education level	second-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			3.0	
Learning profile	general academic profile		Assessment form			exam	
Conducting unit	Department of Pharmaceutical Technology and Biochemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Tomasz Laskowski				
	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		5.0		10.0	75
Subject objectives	The aim of the course “Data Structures” is to introduce students to the fundamentals of algorithms and data structures, with particular emphasis on their applications in the analysis of chemical and biological data. Students will learn the principles of designing, implementing, and optimizing algorithms, including the analysis of their computational and memory complexity, enabling efficient processing of large data sets. The course covers methods of data representation and organization, including arrays, lists, trees, and graphs, as well as techniques for searching, sorting, and processing data characteristic of bioinformatics and cheminformatics. Students will acquire the ability to select appropriate data structures and algorithms for specific problems, such as DNA/RNA sequence analysis, molecular structure processing, and database exploration.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_K04] is ready to effectively organize their work time, including reliably meeting deadlines for completing specific tasks.	is ready to manage their time effectively and complete assigned tasks within the set deadline.	[SK2] Assessment of progress of work [SK3] Assessment of ability to organize work
	[K7_U04] is able to accurately select and apply research methods and tools appropriate to the curriculum in the field of biological, medical, and chemical sciences, including molecular, systems, and medical biology, biotechnology, and bioinformatics.	is able to select the appropriate tool to solve a specific problem related to nucleotide sequence processing.	[SU4] Assessment of ability to use methods and tools
	[K7_U02] is able to use IT tools for operations on nucleotide and protein sequences.	is able to choose an appropriate method for a given task, can write a suitable algorithm, and can use various data structures effectively.	[SU1] Assessment of task fulfilment
	[K7_W07] has a thorough knowledge and understanding of the structure and operating principles of components and systems related to the field of study, including theories, methods, and complex relationships between them, as well as selected specific issues relevant to the curriculum InfoBioChem	know and t is able to use Python and Java programming languages, understands the complexity of algorithms and asymptotic analysis, primal and abstract data.	[SW1] Assessment of factual knowledge
Subject contents	Course content – lecture		
	<ol style="list-style-type: none">1. Data types (simple, composite, primitive, object-oriented)2. One- and two-dimensional arrays, sorting algorithms3. Computational complexity and algorithm quality4. Lists and queues (linked lists, stacks, queues)5. Algorithm design methods6. Hash tables7. Trees8. Text algorithms (pattern searching) and data structures for texts (suffix trees and suffix arrays)9. Graphs (graph traversal, cycle detection, De Bruijn graph)10. Finding the shortest path (Dijkstra and Bellman-Ford algorithms)11. Applications of various data structures in bioinformatics		
	Course content – laboratory		
	In the practical part, students independently implement the algorithms and data structures discussed in lectures, with particular emphasis on their applications in processing biological and chemical data. The classes include implementation of algorithms, analysis of their correctness and complexity, and performance optimization.		
	Problems discussed during the classes include, among others:		
	<ul style="list-style-type: none">• Selecting a solution for a problem and practical use of basic data structures: list, queue, stack, and methods of their implementation.• Ability to adapt basic algorithms to specific problems.		
Prerequisites and co-requisites	Basic knowledge of Python		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture: written exam	60.0%	50.0%
	Laboratory: reports	60.0%	50.0%
Recommended reading	Basic literature	T. Cormen, Introduction to Algorithms, The MIT Press 2009	
	Supplementary literature	J. D. Ullman, J.E. Hopcroft, A. V. Aho, Data Structures and Algorithms, Addison-Wesley Educational Publishers Inc, 2001	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none">• Searching for selected motifs in DNA sequences.• Sorting lists of chemical compounds.• k-mer mapping		
Practical activites within the subject	Not applicable		

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