University of Gdańsk

Subject card

Subject name and code	Combinatorial optimization, PG_00143561		
Field of study	Informatics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2027/2028
Education level	Bachelor's 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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	academic	Assessment form	
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Paweł Żyliński	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

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	30	0.0	45.0	75

Subject objectives

A review of advanced algorithmic methods based on applications in graph theory, computational geometry, and other optimization issues. Familiarizing students with English nomenclature.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFL3_W03] has structured, theoretically grounded general knowledge in the field of algorithms and data structures, formal languages, automata theory and computational complexity, and artificial intelligence	knows selected methods of algorithmic solving of computationally difficult problems, e.g. approximation algorithms, approximation schemes, randomized algorithms, integer linear programming; knows selected algorithmic techniques with examples of applications: e.g. sweep-line technique, flows in networks;	[SW4] test/exam - oral or written [SW5] implementation of a problem task
[INFL3_W10] knows the basic principles of occupational health and safety in the IT profession	knows the basic principles of occupational health and safety in the IT profession;	[SW5] implementation of a problem task
[INFL3_U03] can design and analyze algorithms for their correctness and computational complexity using appropriate algorithmic techniques and data structures	is able to apply the acquired techniques to solve algorithmic problems; tries to analyze the constructed solutions in terms of computational complexity and solution optimality;	[SU4] test/exam - oral or written [SU5] implementation of a problem task
[INFL3_U02] can precisely formulate questions to deepen one's understanding of a given topic or find missing elements of reasoning	is able to distinguish and isolate such properties of problems that allow the use of a specific technique;	[SU4] test/exam - oral or written [SU5] implementation of a problem task

<table>
<tr><td>Subject contents</td><td>1. Flows in networks with applications.
2. Approximation algorithms and approximation schemes.
3. Randomized algorithms.
4. Sweep-line technique.
5. Linear programming.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>1. Discrete mathematics.
2. Linear algebra with analytic geometry.
3. Algorithms and data structures.
4. Graph and network theory (basics).
5. Programming skills.</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>implementing/coding</td><td>51.0%</td><td>40.0%</td></tr>
<tr><td>final test</td><td>51.0%</td><td>20.0%</td></tr>
<tr><td>test</td><td>51.0%</td><td>40.0%</td></tr>
</table>
</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. M. de Berg, M. van Kreveld, M. Overmars, O. Schwarzkopf: Computational Geometry - Algorithms and Applications, Springer (2000)
2. T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein: Introduction to Algorithms, MIT (2022)
3. S. Dasgupta, C.H. Papadimitriou, U.V. Vazirani: Algorithms, McGraw-Hill Higher Education (2006)
4. V.V. Vazirani: Approximation Algorithms, Springer (2003)</td></tr>
<tr><td>Supplementary literature</td><td>1. S. Har-Peled: Geometric Approximation Algorithms, AMS (2011)
2. R. Motwani, P. Raghavan: Randomized Algorithms, Cambridge University Press (1995)
3. F.P. Preparata, M.I. Shamos: Computational Geometry: An Introduction, Springer (1985)
4. M.M. Sysło, N. Deo, J.S. Kowalik: Algorytmy optymalizacji dyskretnej, PWN (1999)</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>not available</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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