University of Gdańsk

Subject card

Subject name and code	Combinatorial Optimization, PG_00179344		
Field of study	Informatics		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
Education level	Bachelor'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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	5.0
Learning profile	practical	Assessment form	
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr Hanna Furmańczyk	
	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	0.0	0.0	60

Subject objectives

The aim of the course is to familiarise the student with basic optimisation algorithms and the methods used in this field. In addition, the student will be introduced to the basics of algorithmic analysis as well as types of algorithms - exact, approximate approaches.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFL3_U01] can apply mathematical knowledge to formulate, analyse and solve tasks related to computer science, design and analyze algorithms in terms of their correctness and computational complexity	- the student is able to model problems in the language of graph theory graphs and express these problems in a formalised way	[SU4] test/exam - oral or written [SU5] implementation of a problem task
[INFL3_U08] assesses the usefulness of various paradigms and related programming tools to solve various types of problems	- the student is able to analyse selected combinatorial optimisation algorithms combinatorial optimisation and their implementation in terms of correctness and computational complexity computational complexity, and program these algorithms	[SU4] test/exam - oral or written [SU5] implementation of a problem task

<table>
<tr><td>Subject contents</td><td>The following topics are planned for the course:
1. Selected basics of graph theory (consistency, strong consistency, graph search)
2. Spanning trees and Steiner trees
3. Linear programming method
4. Shortest path problem
5. Flows in networks
6. Selected problems of task scheduling (deterministic model, scheduling on parallel machines, dedicated machines, scheduling of tasks with conflicts)
7. Approximate algorithms
8. Backpacking problems, etc.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>1. Discrete mathematics
2. Algorithms and data structures
3. Ability to program in any language.</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>51.0%</td><td>40.0%</td></tr><tr><td>colloquium</td><td>51.0%</td><td>20.0%</td></tr><tr><td>programming tasks</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. B. Korte, J. Vygen, Combinatorial optimization. Theory and algorithn
2. Ch.H. Papadimitriou, K. Steiglitz, Combinatorial optimization. Algorit
3. P. Brucker, Scheduling algorithms, Springer 2006.
4. J. Wojciechowski, K. Pieńkosz, Grafy i sieci, PWN 2013.</td></tr><tr><td>Supplementary literature</td><td>none</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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