GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Graphtheoretic Modelling of Systems, PG_00068828		
Field of study	Informatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2029/2030
Education level	first-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	4	Language of instruction	Polish
Semester of study	7	ECTS credits	6.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Algorithms and Systems Modelling -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Marcin Jurkiewicz	
	Teachers	dr Marcin Jurkiewicz	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	15.0	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	8.0	112.0	150

Subject objectives

The goal of the course is gaining skills in the area of the analysis of algorithms and graph-theoretic modeling selected real-life problems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	knows mathematical foundations restricted to the design of graph algorithms	[SW1] Assessment of factual knowledge
[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn	is able to apply graph-theoretic modeling methods	[SU1] Assessment of task fulfilment
[K6_U08] while identifying and formulating specifications of engineering tasks related to the field of study and solving these tasks, can:n- apply analytical, simulation and experimental methods,n- notice their systemic and non-technical aspects,n- make a preliminary economic assessment of suggested solutions and engineering work n	is able to analyze a given problem, implement and test its solution in accordance with the specified requirements (e.g., by selecting the simplest solutions)	[SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>Course content – lecture
1. Introduction. 2. Introduction to graph theory (selected definitions). 3. Introduction to the analysis of algorithms. 4. Basic data structures used for graph representation. 5. Single source shortest paths and their applications. 6. Shortest paths between all pairs of vertices. 7. Applications of path algorithms in practical situations. 8. The traveling salesman problem - algorithms and applications. 9. Problems of computing spanning trees and their practical applications. 10. The maximum flow problem in graphs. 11. Matchings in graphs and their applications. 12. Introduction to the graph coloring problem - definitions, models and applications. 13. Generalizations of the graph coloring problem. 14. Selected graph coloring algorithms and their applications. 15. An overview of selected techniques of designing graph algorithms.
Course content – project
Tasks to be completed based on the topics presented in the lecture.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>The basic knowledge on the analysis of algorithms and computer programming.</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>Written exam</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Project</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein, Introduction to algorithms, WNT, 2004.
2. M. Kubale Ed., Discrete optimization. Models and methods of graph coloring, WNT, 2001.</td></tr>
<tr><td>Supplementary literature</td><td>1. D. Dereniowski, Lectures available on the eLearning platform
2. 3. M.M. Sysło, N. Deo, J.S. Kowalik, Discrete optimization algorithms: with Pascal programs, PWN, 1993.</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>Practical activites within the subject</td><td>Not applicable</td></tr>
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