GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Discrete mathematics, PG_00067266		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	first-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	assessment
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics Telecommunications and Informatics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mariusz Domżalski	
	Teachers	dr inż. Mariusz Domżalski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	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	3.0	42.0	75

Subject objectives

- Assimilation of knowledge of set theory, mathematical logic, data structures (trees) and graph theory.
- Learning algorithms of graph coloring and searching for the shortest path in the graph.

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	Student got knowledge on set theory, mathematical logic, data structures (trees) and graph theory. Student learned basic algorithms for searching in data structures (trees), graph coloring and searching for the shortest path in graphs. Student got prepared for analysing simple algorithms and implementation of the presented algorithms in practice.	[SU1] Assessment of task fulfilment [SK2] Assessment of progress of work
[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	Student is able to use knowledge of discrete mathematics including set theory, logic and basic graph algorithms. Student is able to use appropriate external sources to solve discrete mathematics problems.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information

<table>
<tr><td>Subject contents</td><td>1. Set theory: operations on sets, Venn diagrams.
2. Mathematical induction.
3. Elements of logic and propositional calculus: basic logical operations, truth tables, quantifiers.
4. Relations: types of relations reflexive, symmetric, antisymmetric, transitive.
5. Equivalence relations and order relations.
6. Functions: injection, surjection, bijection, invertible function, function composition.
7. Introduction to graph theory: subgraphs, isomorphic graphs, homeomorphic graphs, planar graphs.
8. Trees: binary trees, tree traversal, binary search trees.
9. Elements of computational complexity theory analysis of algorithms.
10. Graph coloring.
11. Eulerian cycles, Hamiltonian cycles.
12. Discrete optimization algorithms finding the shortest path in a graph.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></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>Tests</td><td>50.0%</td><td>90.0%</td></tr>
<tr><td>Homework</td><td>50.0%</td><td>10.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>- K. Rosen, Discrete Mathematics and Its Applications 8th Edition, McGraw-Hill Education, 2018

- S.S. Epp, Discrete Mathematics with Applications, 5th Edition, Cengage Learning, 2019.

- A.Szepietowski, Matematyka Dyskretna, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2006.

- K.A. Ross, C.R.B. Wright, Matematyka Dyskretna, PWN, 2006.</td></tr>
<tr><td>Supplementary literature</td><td>Resources available in the internet.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>- Determine the truth table for the given logical function.
- Using the principle of mathematical induction, prove that 7^n - 2^n is divisible by 5 for any natural number n.
- What are the properties of the relation "x is greater than y" for real numbers x and y?
- Is the given graph a planar graph? (or as an instruction: Determine if the given graph is planar.)
- Find the shortest path in the given graph.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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