



## Subject card

Subject name and code	Discrete mathematics, PG_00047546						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2020/2021		
Education level	first-cycle studies	Subject group			Obligatory subject group 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			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Mariusz Domżałski				
	Teachers		dr inż. Mariusz Domżałski				
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	4.0		66.0	100	
Subject objectives	<ul style="list-style-type: none"> <li>Assimilation of knowledge of set theory, mathematical logic, data structures (trees) and graph theory.</li> <li>Learning algorithms of graph coloring and searching for the shortest path in the graph.</li> </ul>						
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.			[SK2] Assessment of progress of work [SU1] Assessment of task fulfilment	
	[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.			[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment	

Subject contents	<ol style="list-style-type: none"> <li>1. Set theory. Set operations. Venn diagrams.</li> <li>2. Mathematical induction.</li> <li>3. Logic and propositional calculus. Basic logical operations and truth tables. Quantifiers.</li> <li>4. Relations. Types of relations – reflexive, symmetric, antisymmetric, transitive.</li> <li>5. Equivalence relations, ordering relations.</li> <li>6. Functions. Injective, surjective and bijective functions. Invertible function. Function composition.</li> <li>7. Introduction to graph theory. Subgraphs, isomorphic and homeomorphic graphs. Planar graphs.</li> <li>8. Trees. Binary trees. Traversing binary trees. Binary search trees</li> <li>9. Introduction to Computational Complexity..</li> <li>10. Graph coloring.</li> <li>11. Discrete optimization methods for searching the cheapest path in the flow graph.</li> <li>12. Discrete optimization methods for searching the maximum flow.</li> <li>13. Eulerian path problems.</li> <li>14. Hamiltonian circuit problem.</li> </ol>			
Prerequisites and co-requisites				
Assessment methods and criteria	Subject passing criteria		Passing threshold	Percentage of the final grade
	Tests		50.0%	90.0%
	Homework		50.0%	10.0%
Recommended reading	Basic literature		<ul style="list-style-type: none"> <li>• A.Szepietowski, <i>Matematyka Dyskretna</i>, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2006.</li> <li>• S.S. Epp, <i>Discrete Mathematics with Applications</i>, Brooks Cole, 2003.</li> <li>• K.A. Ross, C.R.B. Wright, <i>Discrete Mathematics</i>, Pearson, 2002.</li> </ul>	
	Supplementary literature		<ul style="list-style-type: none"> <li>• Resources available in the internet.</li> </ul>	
	eResources addresses			
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> <li>• Find the truth table of a given logic function.</li> <li>• Use mathematical induction to show that 5 divides <math>7^n - 2^n</math>, for any natural number n.</li> <li>• What properties has the relation "x is greater than y" for real numbers x and y.</li> <li>• Decide whether a given graph is planar.</li> <li>• Find the shortest path in a given graph.</li> </ul>			
Work placement	Not applicable			