

Subject card

Subject name and code	Discrete Mathematics, PG_00155386						
Field of study	Mathematics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2025/2026		
Education level	Bachelor's 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		5.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Division of Set Theory -> Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Andrzej Nowik				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	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		5.0		60.0	125
Subject objectives	The aim of the course is to familiarize students with the general methods of discrete mathematics, i.e. mathematics of finite (or at most countable) structures, and to develop students' ability to understand the abstract problems of discrete mathematics. One need these skills to study most areas of mathematics.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[MATL3_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; is willing to act ethically	The student knows and understands the theorems that are the subject of the lecture along with appropriate definitions, examples and proofs concerning graph theory.	[SK4] test/exam - oral or written
	[MATL3_W09] knows and understands the role and importance of proof in mathematics, as well as the concept of the importance of assumptions	The student knows and understands the theorems that are the subject of the lecture along with appropriate definitions, examples and proofs.	[SW4] test/exam - oral or written
	[MATL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education	The student is able to give the definitions and properties of: greatest common divisor, least common multiple, Euler's phi function, is able to describe the iterated squaring algorithm, knows and is able to formulate the Chinese Remainder Theorem, knows at least one probabilistic primality test, is able to describe the RSA protocol.	[SK4] test/exam - oral or written
	[MATL3_K06] is ready to formulate opinions on basic mathematical issues	The student is able to indicate (and justify why) which operations for large numbers are computationally difficult and for which there is a fast algorithm for calculating them. Is able to describe the Euclidean algorithm and give its applications.	[SK4] test/exam - oral or written
	[MATL3_W01] knows and understands the basic concepts, methods and theorems of mathematical logic and set theory, as well as basic examples illustrating specific concepts in these fields and enabling the refutation erroneous hypotheses or unauthorized reasoning	The student knows and understands the elements of logic, set theory, and in particular the theorems that are the subject of the lecture along with appropriate definitions, examples and proofs.	[SW4] test/exam - oral or written
	[MATL3_W08] knows and understands the structure of mathematical theories, is able to use mathematical formalism to build and analyze simple mathematical models in other fields of science	The student knows the basic concepts of combinatorics and is able to calculate the number of combinatorial objects.	[SW4] test/exam - oral or written
	[MATL3_U01] is able to correctly use the known concepts of mathematical logic and set theory, is able - at a simple and medium level of difficulty - to apply the known theorems and methods of these fields and is able to interpret the obtained results	The student knows and understands the elements of logic, set theory, combinatorics, Boolean networks, graph theory and number theory, in particular the theorems that are the subject of the lecture along with the appropriate definitions, examples and proofs.	[SU4] test/exam - oral or written
	[MATL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning	The student knows and understands the theorems that are the subject of the lecture along with appropriate definitions, examples and proofs concerning number theory.	[SK4] test/exam - oral or written
	[MATL3_U09] is able to plan how to solve a specific problem and prepare a correct record of this solution, providing strict and precise justification for the correctness of his reasoning	The student is able to efficiently switch between various number systems, knows the basic rules of notation and operations in these systems, in particular the theorems that are the subject of the lecture along with appropriate examples.	[SU4] test/exam - oral or written

Subject contents	Non-decimal numeral systems, binary system. Combinatorics: sequences, permutations, functions, subsets, Newton's symbol, Exclusion/Inclusion Principle, Boolean functions, Boolean expressions. Number theory: divisibility of numbers, congruence relation, Euclid's algorithm, prime factorization of numbers, Chinese remainder theorem, fast exponentiation. Induction and recursion, recursive functions. Graphs: graph isomorphism, trees, spanning trees, algorithm for finding the minimum spanning tree, graph coloring, Euler/ Hamilton cycles and paths, algorithm for finding the shortest path.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	51.0%	70.0%
	tests	51.0%	30.0%
Recommended reading	Basic literature	A. Literatura wymagana do ostatecznego zaliczenia zajęć (zdania egzaminu): A.1. wykorzystywana podczas zajęć A. Szepietowski, „Matematyka dyskretna”, Wydawnictwo WUG, Gdańsk 2006. A.2. studiowana samodzielnie przez studenta R.L. Graham, D.E. Knuth, O. Patashnik, „Matematyka konkretna”, PWN, Warszawa 1996; Kenneth A. Ross, Charles R.B. Wright, „Matematyka dyskretna”, PWN, Warszawa 1996; B. Literatura uzupełniająca R.J Wilson, „Wprowadzenie do teorii grafów”, PWN, Warszawa 2004;	
	Supplementary literature	R.J Wilson, "An introduction to the graph theory", PWN, Warszawa 2004;	
	eResources addresses		
	Example issues/ example questions/ tasks being completed	1. Formulating the Chinese Remainder Theorem and providing its applications; 2. Sample analysis of a graph - finding its Eulerian cycle (if it exists) using Fleury's algorithm, possibly checking whether sufficient conditions for the existence of Hamiltonian cycles can be applied (Ore's, Dirac's, etc.); finding the minimum spanning tree (here the graph should be weighted) 3. Decoding and encoding the tree using Prufer's code.	
Work placement	Not applicable		

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