University of Gdańsk

Subject card

Subject name and code	Introduction to Mathematics, PG_00198505		
Field of study	Informatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study
Mode of study	part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Magda Dettlaff	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	20.0	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	0.0	95.0	125

Subject objectives

The primary objective of this course is to develop and hone students' ability to apply methods of propositional calculus, quantifiers, and mathematical induction in defining concepts, conducting reasoning, and proving theorems, as well as performing operations on sets and functions, interpreting problems from other areas of mathematics and computer science in the language of set theory, functions, and relations; and understanding issues related to various types of infinity and different orders within sets.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFOL3_W02] knows and undrstands advanced concepts of discrete mathematics, probabilistic methods and statistics	The student has knowledge of the concepts of propositional calculus and set theory, and can describe the basic properties of the set of natural numbers, functions, and relations. The student is able to understand and carry out simple mathematical proofs.	[SW4] test/exam - oral or written [SW5] implementation of a problem task
[INFOL3_U02] is able to use his/her knowledge of higher mathematics to model and solve complex problems	He applies his knowledge of set theory, functions, and relations to construct mathematical models.	[SU4] test/exam - oral or written [SU5] implementation of a problem task

Subject contents

1. Proposition calculus. Sentence-forming functors. Laws (tautologies) of proposition calculus. Logical square. Inference rules. Methods of proving theorems. Analysis of reasoning.
2. Sets. The extensionality principle. Subsets. Operations on sets. Cartesian product of sets. Quantifier calculus. Generalized sum and generalized product of a family of sets. Set field. Axioms of set theory.
3. Mathematical induction and recurrence. Natural numbers. The principle of the minimum. Various versions of the mathematical induction theorem. Examples of recurrence and definition by induction.
4. Functions. Definition of a function and types of functions. Properties of functions. Operations on functions. Invertibility of functions. Images and preimages.
5. Relations. The concept of a relation. Elementary properties and types of relations. The equivalence relation and classes of abstraction. Partially ordered sets. Well-ordered sets. The linear ordering relation.
6. Cardinalities of sets. Equivalence of sets. Cardinalities of sets and comparing cardinalities. The Cantor–Bernstein theorem. Countable and uncountable sets. Sets of continuum cardinality. The continuum hypothesis.
7. Boolean algebra. Definition, examples, and basic properties of Boolean algebras. Ordering relations in Boolean algebra. Boolean functions. Analysis and synthesis of logical circuits.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Knowledge of mathematics at secondary school level.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>homeworks</td><td>51.0%</td><td>5.0%</td></tr>
<tr><td>tests</td><td>51.0%</td><td>60.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>35.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. J. Topp, Wstęp do matematyki, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2015.
2. W. Guzicki, P. Zakrzewski, Wykłady ze wstępu do matematyki. Wprowadzenie do teorii mnogości, WN PWN, Warszawa 2005.
3. W. Guzicki, P. Zakrzewski, Wstęp do matematyki. Zbiór zadań, WN PWN, Warszawa 2005.
4. J. Kraszewski, Wstęp do matematyki, WNT, Warszawa 2007.
5. H. Rasiowa, Wstęp do matematyki współczesnej, WN PWN, Warszawa 2004.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">non applicable</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Prove that the given relation is an equivalence relation, and determine its classes of abstraction.

Perform an inductive proof.

Check whether the function f: R → R, defined by the formula f(x) = 3x + 5, is a bijection.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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