



Subject card

Subject name and code		Mathematics I, PG_00058736						
Field of study		Environmental Engineering						
Date of commencement of studies		October 2026	Academic year of realisation of subject			2026/2027		
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		1	ECTS credits			9.0		
Learning profile		general academic profile	Assessment form			exam		
Conducting unit		Mathematics Center -> Vice-Rector For Education						
Name and surname of lecturer (lecturers)		Subject supervisor		dr Cezary Mrozicki				
		Teachers						
Lesson types		Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
		Number of study hours	45.0	60.0	0.0	0.0	0.0	105
		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	105	8.0		112.0		225
Subject objectives		Students obtain competence in the range of using methods of mathematical analysis and knowledge how to solve simple problems that can be found in the field of engineering.						
Learning outcomes		Course outcome	Subject outcome			Method of verification		
		[K6_U01] has the ability to self-education, can obtain information from literature, databases and other sources, uses information technology, Internet resources; can integrate the obtained information, make their interpretation, as well as draw conclusions and formulate and justify opinions	The student combines knowledge of mathematics with knowledge from other fields.			[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
		[K6_W01] has knowledge in the field of mathematics, including: linear algebra, mathematical analysis and elements of mathematical statistics, probability theory, applications of mathematics, including mathematical methods and numerical methods, necessary for: 1) description and analysis of hydrological phenomena; 2) description and analysis of meteorological phenomena; 3) solving project tasks of the sanitary industry;	The student lists the basic properties of elementary functions. The student solves equations and inequalities containing elementary functions. The student interprets geometrically the study of graphs of functions using the concept of limit and continuity of functions. The student defines the basic concepts of differential calculus of one variable. The student analyses the properties of functions on the basis of an examination of its first and second derivative. The student applies the basic rules and techniques of integration to calculate indefinite integrals. The student lists geometrical applications of definite integrals. The student distinguishes between types of improper integrals. The student solves equations using complex numbers.			[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge		

Subject contents	<p>Course content – lecture</p> <p>Functions of one variable and their properties: The absolute value function definition, solving equations and inequalities with absolute value, graphs of functions with absolute value. Power, exponential, logarithmic, trigonometric and cyclometric functions properties and graphs, solving equations and inequalities.</p> <p>Limits and continuity: Infinite sequences. Fundamental definitions of limit of sequence, convergence and divergence, limit theorems. Applications to solving equation.</p> <p>Differential calculus of functions with one variable and applications of differential calculus of functions with one variable: Definition of first derivative and differential. Rolls and Lagranges theorems. Higher derivatives and differentials. Monotonicity and local extrema. Convexity, concavity and inflexion points of a function. De l'Hospital's Theorem. Taylor's Theorem. Asymptotes. Applying differential calculus to study the properties of one variable functions.</p> <p>Integral calculus of functions with one variable indefinite integral: Basic methods and ways of integration - integration by parts and substitution. Integration of rational functions, trigonometric and irrational.</p> <p>Definite integrals in Riemann's sense: Newton-Leibnitz Theorem. Integration formulas, the substitution method of integration and integration by parts for definite integrals. Applications of integral calculus in computing areas of plane figures, lengths of arcs, volumes of solids of resolution.</p> <p>Improper integral: Definition. Types of integrals.</p> <p>Analytic geometry in 3-space: Basic vectors definitions and properties. Eigenvectors and Eigenvalues. Dot product, cross product, triple scalar product - their properties and applications. Equations for lines and planes in 3-space. The distance from a point to a plane. Angles between planes and lines.</p> <p>Complex numbers: Algebraic form, equality, conjugation, operations, modulus, trigonometric form, operations in polar form, roots, solving equations.</p>											
Prerequisites and co-requisites	There are no preliminary or additional requirements.											
Assessment methods and criteria	<table border="1" data-bbox="448 1240 1477 1346"> <thead> <tr> <th data-bbox="448 1240 794 1279">Subject passing criteria</th> <th data-bbox="794 1240 1141 1279">Passing threshold</th> <th data-bbox="1141 1240 1477 1279">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 1279 794 1317">Midterm colloquium</td> <td data-bbox="794 1279 1141 1317">50.0%</td> <td data-bbox="1141 1279 1477 1317">50.0%</td> </tr> <tr> <td data-bbox="448 1317 794 1346">Written exam</td> <td data-bbox="794 1317 1141 1346">50.0%</td> <td data-bbox="1141 1317 1477 1346">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Midterm colloquium	50.0%	50.0%	Written exam	50.0%	50.0%
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Written exam	50.0%	50.0%										
Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<p>Pod redakcją B. Wiekła, <i>Matematyka. Podstawy z elementami matematyki wyższej</i>. Wydawnictwo PG, Gdańsk 2009</p> <p>W. Krysicki, L. Włodarski, <i>Analiza matematyczna w zadaniach 1</i>, Wydawnictwo Naukowe PWN, Warszawa 2008</p> <p>M. Gewert, Z. Skoczylas, <i>Analiza matematyczna 1. Definicje. Twierdzenia. Wzory</i>. Oficyna Wydawnicza GIS, Wrocław 2008</p> <p>M. Gewert, Z. Skoczylas, <i>Analiza matematyczna 1. Przykłady i zadania</i>. Oficyna Wydawnicza GIS, Wrocław 2008</p> <p>T. Jurliewicz, Z. Skoczylas, <i>Algebra liniowa 1. Definicje. Twierdzenia. Wzory</i>. Oficyna Wydawnicza GIS, Wrocław 2006</p> <p>T. Jurliewicz, Z. Skoczylas, <i>Algebra liniowa 1. Przykłady i zadania</i>. Oficyna Wydawnicza GIS, Wrocław 2006</p> <p>K. Jankowska, T. Jankowski, <i>Zbiór zadań z matematyki</i>, Wydawnictwo PG, Gdańsk 2008</p> <p>K. Jankowska, T. Jankowski, <i>Zadania z matematyki wyższej</i>, Wydawnictwo PG, Gdańsk 2008</p> <p>K. Jankowska, T. Jankowski, <i>Funkcje wielu zmiennych. Całki wielokrotne. Geometria analityczna</i>, Wydawnictwo PG, Gdańsk 2008</p> <p>W. Leksiński, I. Nabiałek, W. Żakowski, <i>Matematyka. Definicje, twierdzenia, przykłady, zadania</i>. WNNT, Warszawa 2006</p>										
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>Investigate the monotonicity of the sequence <math>(a_n)</math>.</li> <li>Enter the properties of the function <math>f(x) = \dots</math>.</li> <li>Calculate the derivative of the function <math>f(x) = \dots</math>.</li> <li>Determine the indefinite integral of the function <math>f(x) = \dots</math>.</li> </ol>											

Practical activities within the subject	Not applicable
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