



Subject card

Subject name and code	Mathematical analysis, PG_00072472						
Field of study	Materials 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		7.0		
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 Anna Niewulis				
	Teachers		mgr Tomasz Kinowski dr Anna Niewulis				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	45.0	0.0	0.0	0.0	75
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 7887 Analiza Matematyczna [IM] [2026/27] (A.Niewulis) https://enauczanie.pg.edu.pl/2025/course/view.php?id=7887						
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	75		5.0		95.0	175
Subject objectives	Students obtain competence in the range of using methods of mathematical analysis and linear algebra 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_U06] is able to integrate acquired information, interpret it, draw conclusions, and formulate and justify opinions using specialist terminology in writing or by actively participating in discussions		Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions. Student understands the need of lifelong learning and improving their engineering knowledge.		[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	[K6_W01] has advanced knowledge of mathematics, useful for formulating and solving complex problems in materials science		Student uses methods of mathematical description of phenomena in the physical / mechanical / chemical processes.		[SW3] Assessment of knowledge contained in written work and projects		

Subject contents	Course content – lecture Functions of one variable, graphs and their properties: • absolute value function definition • power functions • rational functions • exponential function • logarithmic functions • trigonometric and cyclometric functions • hyperbolic functions • Composite and inverse funktion Infinite sequences: • arithmetic and geometric sequences • fundamental definitions and theorems of limit of sequence • Eulers numer Limits and continuity of functions: • Basic definitions and theorems concerning limits and continuity of functions. Differential calculus of a single-variable function: • Definition of the derivative and the differential of a function. • Rolles and Lagranges theorems. • Higher-order derivatives and differentials. • Monotonicity and local extrema of functions. Concavity, convexity, and inflection points. Asymptotes of functions. • De l'Hospitals rule. Taylors theorem. Integral calculus of a single-variable function: • Indefinite integral: basic methods and techniques of integration, integration by parts and substitution. • Integration of rational, trigonometric, and irrational functions. • Definite integral in the sense of Riemann: NewtonLeibniz theorem. • Basic computational methods, substitution and integration by parts for definite integrals. Improper integrals: definition and types Course content – exercises Functions of one variable: • solving equations and inequalities with absolute value, graphs of functions with absolute value • solving power and polynomial equations and inequalities • solving national equations and inequalities • solving exponential equations and inequalities • solving logarithmic equations and inequalities • solving trigonometric equations and inequalities Infinite sequences: • evaluation of sequence limits • Eulers number Limits and continuity of functions: • Calculating limits and examining continuity of functions. • Applications to solving equations. Differential calculus of a single-variable function: • Applications of differential calculus of a single-variable function. • Use in analyzing stages of investigating the behavior of functions. Integral calculus of a single-variable function: • Indefinite integral: integration by parts and substitution, integration of rational, trigonometric, and irrational functions. • Definite integral: substitution and integration by parts for definite integrals. • Applications of definite integrals in calculating areas of plane regions, arc lengths, and volumes of solids of revolution.
Prerequisites and co-requisites	

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Colloquium	50.0%	50.0%
	Exam	50.0%	50.0%
Recommended reading	Basic literature	1. B. Wkieł, Matematyka. Podstawy z elementami matematyki wyższej. Wydawnictwo PG, Gdańsk 2009 2. W. Krysiński, L. Włodarski, Analiza matematyczna w zadaniach, cz. I i II, Warszaw: PWN, 2006 3. K. K. Jankowska, T. Jankowski, Zadania z matematyki wyższej, Wydawnictwo PG, Gdańsk 2008 4. M Gewert, Z Skoczylas, Analiza matematyczna 1, Wrocław: GiS, 2004.	
	Supplementary literature	1. M Lassak, Matematyka dla studiów technicznych, Warszawa: Supremum, 2004. 2. W. Leksiński, I. Nabiałek, Żakowski W., Matematyka. Definicje, twierdzenia, przykłady, zadania, Warszawa: WNT, 2003.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Find the domain and the set of values of the function . Determine the inverse function of f. 2. Find the derivative of the function 3. Find local extremes and intervals of monotonicity of the following function 4. Determine indefinite integrals of the following functions 5. Give three applications of the definite integral with appropriate rules. 6. Find the volume of a solid obtained by rotating around the axis OX the graph of the function 7. Solve the logarithmic equation (exponential) 8. Find the area between the two curves		
Practical activites within the subject	Not applicable		

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