



## Subject card

Subject name and code	Mathematics I, PG_00042603						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2021/2022		
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific research 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		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 Krzysztof Radziszewski				
	Teachers		dr Marcin Szyszkowski  dr Krzysztof Radziszewski				
Lesson types and methods of instruction	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						
	Adresy na platformie eNauczanie: WILiŚ - Bud. IŚ niestacjonarne sem.1 - Matematyka 2021/2022 (K.Radziszewski) - Moodle ID: 16458 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=16458">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=16458</a>						
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		12.0		154.0	226
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_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;	Student defines basic notions of matrix calculus. Student calculates determinants of any degree. Student describes methods of solving systems of linear equations. Student analyses a tasks from analytical geometry. Student solves equations and inequalities with elementary functions. Student determines intervals of monotonicity of a given functions and its extrema. Student geometrically interprets the results of an examinations of a graph of a functions using concept of limit, continuity and derivatives of functions. Student applies the basic rules and techniques of integration to calculate indefinite integrals	[SW1] Assessment of factual knowledge
	[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	Student recognizes the importance of self-expanding knowledge and takes the challenge of working with a group to solve a problem. Student combines knowledge of mathematics with knowledge from other fields. Student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in the future. Student recognizes the importance of self-expanding knowledge. Student uses methods of mathematical description of phenomena in the physical / mechanical. Student understands the need of lifelong learning. Student is able to inspire others and organize their learning process. Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions.	[SU1] Assessment of task fulfilment
Subject contents	Matrices (definition, types of matrices, matrix operations). Determinants and their properties. Rank of a matrix. Inverse of a square non-singular matrix. Systems of linear equations. Cramer's theorem. Kronecker-Capelly theorem. Gauss-Jordan elimination. Basic vectors definitions and properties. Dot product, cross product, their properties and its applications. The triple scalar product and applications. Equations of lines and planes in 3-space. The distance from a point to a plan. Angles between planes and lines. 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 functions – solving power and polynomial equations and inequalities. Rational functions – solving rational equations and inequalities. Exponential function – properties and graphs, solving exponential equations and inequalities. Logarithmic functions – properties and graphs, solving logarithmic equations and inequalities. Trigonometric and cyclometric functions – properties and graphs, solving trigonometric equations and inequalities. Limits and continuity: Infinite sequences. Fundamental definitions of limit of sequence, convergence and divergence, limit theorems. Applications to solving equation. Differential calculus of functions with one variable and applications of differential calculus of functions with one variable: Definition of first derivative and differential. Roll's and Lagrange's theorems. Higher derivatives and differentials. Monotonicity and local extrema. Convexity, concavity and inflexion points of a function. De l'Hospital's Thorem. Asymptotes. Applying differential calculus to studying the properties of functions with one variable. Integral calculus of functions with one variable – antiderivatives: The process of finding antiderivatives and integration formulas – the substitution method of integration and integration by parts. Integration of rational, trigonometric and irrational functions.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	50.0%	40.0%
	Written exam	50.0%	60.0%
Recommended reading	Basic literature	1. Praca zbiorowa pod redakcją B. Wiekła, Matematyka - Podstawy z elementami matematyki wyższej, PG, Gdańsk 2007. 2. K. Jankowska, T. Jankowski, Zbiór zadań z matematyki, PG, Gdańsk 1997. 3. Praca zbiorowa pod red. E. Mieloszyka, Matematyka – Materiały pomocnicze do ćwiczeń, PG, Gdańsk 2004. 4. R. Leitner, Zarys matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 2001. 5. R. Leitner, W. Matuszewski, Z. Rojek, Zadania z matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 1999. 6. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 – Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2001.	

	Supplementary literature	7. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 – Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2001. 8. W. Krywicki, L. Włodarski, Analiza matematyczna w zadaniach I i II, Wydawnictwo Naukowe PWN, Warszawa 1998. 9. T. Jurewicz, Z. Skoczylas, Algebra liniowa 1 – Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2002. 10. T. Jurewicz, Z. Skoczylas, Algebra liniowa 1 – Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2002. 11. E. Mieloszyk, Macierze, wyznaczniki i układy równań, PG, Gdańsk 2003.
	eResources addresses	WILiŚ - Bud. IŚ niestacjonarne sem.1 - Matematyka 2021/2022 (K.Radziszewski) - Moodle ID: 16458 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=16458">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=16458</a>
Example issues/ example questions/ tasks being completed	1. Find the domain and the set of values of the function $f(x)=\arcsin(3x-2)+\pi$ . Determine the inverse function of $f$ . 2. Find the derivative of $y=4x(3x^2+5)^5$ . 3. Sketch the graph of the function $f(x)=x-\ln x$ . Identify any local extrema and points of inflection. 4. Find the absolute extrema of $f(x)=4x-36x-1$ on the interval $[1,6]$ . 5. Calculate $\int 4x-1 \ln x \, dx$ . 6. Find $A^{-1}$ if the matrix $A$ is a $2 \times 2$ matrix of the elements $a_{ij} = 3i - j$ . 7. Find the distance between lines $l: (x-9)/4 = (y+2)/(-3) = z$ and $k: x/(-2) = (y+7)/9 = (z-2)/2$ .	
Work placement	Not applicable	