



Subject card

Subject name and code	Mathematics II, PG_00059245						
Field of study	Civil Engineering						
Date of commencement of studies	October 2023	Academic year of realisation of subject	2023/2024				
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	2	ECTS credits	5.0				
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 Jolanta Dymkowska					
	Teachers	dr Jolanta Dymkowska mgr Dorota Grott dr inż. Renata Zakrzewska mgr Danuta Beger mgr Małgorzata Kula					
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						
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	6.0	59.0	125		
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_U01] Apply knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering to solve engineering problems and issues.	Student solves matrix equations and systems of linear equations. Student analyses a tasks from analytical geometry. Student computes partial derivatives and uses differential calculus to examine properties of the function of several variables. Student solves ordinary differential equations, using informations about complex numbers. Student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in future.	[SU1] Assessment of task fulfilment
	[K6_W01] Demonstrate knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering at a level necessary to achieve the other programme outcomes.	Student solves matrix equations and systems of linear equations. Student analyses a tasks from analytical geometry. Student computes partial derivatives and uses differential calculus to examine properties of the function of several variables. Student solves ordinary differential equations, using informations about complex numbers. Student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in future.	[SW1] Assessment of factual knowledge
Subject contents	<p>Elements of linear algebra: Matrices, their properties and arithmetics. Determinants. Inverse of a square matrix.</p> <p>Analytic geometry: Basic vectors definitions and properties. Eigenvectors and Eigenvalues. Dot product, cross product, their properties and applications. The triple scalar product and applications. Equations for lines and planes in 3-space. The distance from a point to a plane. Angles between planes and lines. Complex numbers.</p> <p>Functions of several variables: Limit and continuity of a function of several variables. Partial derivatives. Total differential. Taylors formula. Maxima and minima of a function of several variables. Ordinary differential equations: First order differential equations. General and particular solution. The Cauchy initial value problem. Variables separable, linear, Bernoulli, exact differential equations. Second order linear differential equations with constant coefficients. Fundamental set of solution of the homogeneous linear differential equation.</p> <p>Non-homogeneous linear differential equations. Higher order linear differential equations with constant coefficients.</p>		
Prerequisites and co-requisites	No requirements		
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	<p>Basic literature</p> <p>J. Dymkowska, D. Beger, Rachunek różniczkowy w zadaniach, PG, Gdańsk 2016</p> <p>E. Mieloszyk, Macierze, wyznaczniki i układy równań, PG, Gdańsk 2003 K. Jankowska, T. Jankowski, Funkcje</p> <p>wielu zmiennych. Całki wielokrotne. Geometria analityczna, PG, Gdańsk 2005 K. Jankowska, T. Jankowski, Zadania z matematyki wyższej, PG, Gdańsk 1999</p>		

	Supplementary literature	T. Jurlawicz, Z. Skoczylas, Algebra liniowa 1 Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2002 T. Jurlawicz, Z. Skoczylas, Algebra liniowa 1 Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2002 E. Mieloszyk, Liczby zespolone, PG, Gdańsk 2003 M. Gewert, Z. Skoczylas, Analiza matematyczna 2 Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2003 M. Gewert, Z. Skoczylas, Analiza matematyczna 2 Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2003 M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne, Oficyna Wydawnicza GiS, Wrocław 2001 R. Leitner, Zarys matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 2001 R. Leitner, W. Matuszewski, Z. Rojek, Zadania z matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 1999 W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach I i II, Wydawnictwo Naukowe PWN, Warszawa 1998
	eResources addresses	Adresy na platformie eNauczanie: WILiŚ - Bud. - Matematyka sem 2 2023/2024 (J. Dymkowska) - Moodle ID: 36056 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36056
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Find A-1 if the matrix A is a 2x2 matrix of the elements $a_{ij} = 3i - j$. 2. Find the distance between lines l: $(x-9)/4 = (y+2)/(-3) = z$ and k: $x/(-2) = (y+7)/9 = (z-2)/2$. 3. Sketch the graph of the function $f(x,y) = (9-x^2-y^2)^{1/2}$. 4. Identify any local extrema of the function $f(x,y) = ex-y(x^2-2y^2)$. 5. Find the absolute extrema of the function $f(x,y) = xy-x(x+1)-y(y+1)$ on the set $D = \{(x,y): x^2+y^2 \leq 25, y \geq 3\}$. 6. Solve the equation $y''+6y'+9y=10\sin x$. 	
Work placement	Not applicable	

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