



Subject card

Subject name and code	Mathematics II, PG_00059245						
Field of study	Civil 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	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 Nikodem Mrożek				
	Teachers						
Lesson types	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>Course content – lecture</p> <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	<table border="1" data-bbox="448 553 1487 658"> <thead> <tr> <th data-bbox="448 553 794 586">Subject passing criteria</th> <th data-bbox="794 553 1141 586">Passing threshold</th> <th data-bbox="1141 553 1487 586">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 586 794 620">Midterm colloquium</td> <td data-bbox="794 586 1141 620">50.0%</td> <td data-bbox="1141 586 1487 620">40.0%</td> </tr> <tr> <td data-bbox="448 620 794 658">Written exam</td> <td data-bbox="794 620 1141 658">50.0%</td> <td data-bbox="1141 620 1487 658">60.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Midterm colloquium	50.0%	40.0%	Written exam	50.0%	60.0%
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Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Find A^{-1} if the matrix A is a 2×2 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 $y'' + 6y' + 9y = 10 \sin x$. 											
Practical activities within the subject	Not applicable											

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