



Subject card

Subject name and code	Mathematics, PG_00069039						
Field of study	Chemical Technology						
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			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 Hanna Guze				
	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		10.0		110.0	225
Subject objectives	The aim of this subject is to obtain the students competence in the range of using the basic methods of mathematical analysis and linear algebra. Furthermore, the student is able to use this knowledge to solve simple theoretical and practical problems that can be found in the field of engineering.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W01] Possesses knowledge of mathematics and physics necessary to analyze and describe technological processes, including differential and integral calculus, numerical methods, statistics and elements of vector analysis.		has knowledge of mathematical analysis, linear algebra, differential and integral calculus of functions of several variables, differential equations, and probability theory, including, among others, convergence criteria for numerical series, basic concepts of matrix calculus, methods of solving systems of linear equations, properties of functions of several variables, applications of multiple integrals, concepts of gradient, divergence, and rotation, basic techniques for solving ordinary differential equations, and basic types of random variable distributions.		[SW1] Assessment of factual knowledge		
	[K6_U01] Is able to independently plan the learning process and acquire, analyse and interpret information from various sources, also in English.		independently selects the method of solving the task, uses available methods and tools, ensures the use of reviewed sources of knowledge and presents the obtained results.		[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools		

<p><b>Subject contents</b></p>	<p>Course content – lecture  Number series: Convergent and divergent series. Definition and other convergence tests of the number series. Alternating series.</p> <p>Elements of linear algebra and geometry: Matrices, their properties and operations on matrices. Determinants. Inverse of a square non-singular matrix. Dot product, cross product, their properties and its applications. The triple scalar product and applications.</p> <p>Systems of linear equations. Cramer formulas. The rank of the main and augmented matrix. Kronecker-Capelli theorem. Gaussian elimination method.</p> <p>Functions of several variables: Limit and continuity. Partial derivatives. Differential. Taylors formula. Maxima and minima of a function of several variables.</p> <p>Multiple integrals: Normal and regular area. Double and triple integral. Change of variables - polar, cylindrical and spherical coordinates. Examples of applications.</p> <p>Elements of field theory: scalar and vector fields. Gradient, divergence, rotation.</p> <p>Ordinary differential equations: First order linear differential equations. Linear differential equations of order n with constant coefficients. Variation of parameters and undetermined coefficients method.</p> <p>Calculus of probability: Discrete and continuous random variable, distribution function, expected value and variance of a random variable. Basic distribution of a random variable.</p>		
	<p>Course content – exercises  Convergence criteria for number series. Conditional and absolute convergence.</p> <p>Operations on matrices. Properties of determinants and their application. Inverse matrices and matrix equations. Application of scalar, vector, and mixed products in geometry.</p> <p>Systems of linear equations - application of inverse matrix, Gaussian elimination, and the Kronecker-Capelli theorem.</p> <p>Calculation and application of partial derivatives of functions of several variables. Analysis of the properties of functions of several variables using local and global extrema.</p> <p>Conversion of double and triple integrals to iterated integrals. Application of double and triple integrals in geometry. Application of polar, cylindrical, and spherical coordinates.</p> <p>Gradient of a scalar field, divergence and rotation of a vector field.</p> <p>Solving first-order and higher-order linear differential equations with constant coefficients using the method of variation of parameters and undetermined coefficients.</p> <p>Discrete and continuous random variables, distribution function, expected value and variance of a random variable.</p>		
<p><b>Prerequisites and co-requisites</b></p>			
<p><b>Assessment methods and criteria</b></p>	<p>Subject passing criteria</p>	<p>Passing threshold</p>	<p>Percentage of the final grade</p>
	<p>Tests and activity during the classes</p>	<p>0.0%</p>	<p>50.0%</p>
	<p>written and/or oral exam</p>	<p>50.0%</p>	<p>50.0%</p>

Recommended reading	Basic literature	<p>- M. Gewert, Z. Skoczylas : Analiza matematyczna 2, Oficyna Wydawnicza GiS, Wrocław;</p> <p>- K. Jankowska, T. Jankowski : Zadania z matematyki wyższej, Wydawnictwo PG, 2010;</p> <p>- K. Jankowska, T. Jankowski : Funkcje wielu zmiennych - Całki wielokrotne - Geometria analityczna, Wydawnictwo PG, 2010;</p> <p>- K. Jankowska, T. Jankowski : Zadania z matematyki wyższej. Wydawnictwo PG, 2010;</p> <p>- E. Mieloszyk : Macierze, wyznaczniki i układy równań, Wydawnictwo PG, 2000;</p> <p>- M. Bednarczyk, A. Dąbrowicz-Tlałka: Elementy rachunku prawdopodobieństwa w zadaniach, Wdawnictwo PG, 2012</p>
	Supplementary literature	<p>G.M. Fichtenholz : Rachunek różniczkowy i całkowy, t. 2, Wydawnictwo Naukowe PWN</p> <p>W. Krywicki, L. Włodarski : Analiza matematyczna w zadaniach II, Wydawnictwo Naukowe PWN</p> <p>W. Stankiewicz : Zadania z matematyki dla wyższych uczelni technicznych, Wydawnictwo Naukowe PWN</p>
	eResources addresses	
Example issues/ example questions/ tasks being completed	<p>Examine the convergence of series ... using the appropriate convergence criterion.</p> <p>Discuss the solvability of the given system of equations ... .</p> <p>Find local extrema of the given function <math>f(x, y) = \dots</math></p> <p>Using cylindrical or spherical coordinates, calculate the given triple integral ...</p> <p>Determine the potential of the vector field ...</p> <p>Using the method of undetermined coefficients, solve the second order linear differential equations.</p> <p>Calculate the expected value and variance of the given random variable of the continuous type ...</p>	
Practical activities within the subject	Not applicable	

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