GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	MATHEMATICS, PG_00064376						
Field of study	Chemistry						
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_K01] understands the need for continuous learning, can inspire and organise learning and others, understands the importance of group and team activities	Student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in the future. Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions.	[SK5] Assessment of ability to solve problems that arise in practice [SK2] Assessment of progress of work
	[K6_W01] applies his/her knowledge of selected branches of mathematics and physics to analyse, interpret and solve problems and to describe physical, chemical phenomena and technological processes	The student 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_U02] determines the time required for the task, plans and organises the work of both the individual and the small team in such a way as to ensure that the task is completed within the set time limit	Student is able to determine the time required to complete tasks, plans the execution of tasks and the manner of their presentation together with the team, cooperates with team members, and ensures timely completion of task stages.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[K6_U04] creates detailed documentation of the results obtained from the experiments carried out individually or as part of a team, analysing and interpreting the results in the form of text documents, spreadsheets, graphs, technological diagrams, multimedia presentations using correct chemical nomenclature	The student is able to: - present solutions to tasks, justifying the choice of calculation method; - optimize the number of steps in the solution leading to the correct result; - use selected applications to solve steps in tasks and visualize and assess their usefulness in a given task;	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents	Course content – lecture Number series: Convergent and divergent series. Definition and other convergence tests of the number series. Alternating series. 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. Systems of linear equations. Cramer formulas. The rank of the main and augmented matrix. Kronecker-Capelli theorem. Gaussian elimination method. Functions of two variables: Limit and continuity of a function of several variables. Partial derivatives. Differential. Taylors formula. Maxima and minima of a function of several variables. Multiple integrals: Normal and regular area. Double and triple integral. Change of variables - polar, cylindrical and spherical coordinates. Examples of applications. Elements of field theory: scalar and vector fields. Gradient, divergence, rotation. Ordinary differential equations: First order linear differential equations. Linear differential equations of order n with constant coefficients. Variation of parameters and undetermined coefficients method. Calculus of probability: Discrete and continuous random variable, distribution function, expected value and variance of a random variable. Basic distribution of a random variable. Course content – exercises Convergence criteria for number series. Conditional and absolute convergence. Operations on matrices. Properties of determinants and their application. Inverse matrices and matrix equations. Application of scalar, vector, and mixed products in geometry. Systems of linear equations application of inverse matrices, Gauss elimination, and the KroneckerCapelli theorem. 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. Conversion of double and triple integrals to iterated integrals. Application of double and triple integrals in geometry. Application of polar, cylindrical, and spherical coordinates. Gradient of a scalar field, divergence and rotation of a vector field. Solving first-order and higher-order linear differential equations with constant coefficients using the method of variation of parameters and undetermined coefficients. Discrete and continuous random variables, distribution function, expected value and variance of a random variable.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Tests and activity during the classes	0.0%	50.0%
Written exam or/and oral	50.0%	50.0%

Recommended reading	Basic literature	- M. Gewert, Z. Skoczylas : Analiza matematyczna 2, Oficyna Wydawnicza GiS, Wrocław; - K. Jankowska, T. Jankowski : Zadania z matematyki wyższej, Wydawnictwo PG, 2010; - K. Jankowska, T. Jankowski : Funkcje wielu zmiennych, Całki wielokrotne, Geometria analityczna, Wydawnictwo PG, 2010; - K. Jankowska, T. Jankowski : Zadania z matematyki wyższej. Wydawnictwo PG, 2010; - E. Mieloszyk : Macierze, wyznaczniki i układy równań, Wydawnictwo PG, 2000; - M. Bednarczyk, A. Dąbrowicz-Tlałka: Elementy rachunku prawdopodobieństwa w zadaniach, Wydawnictwo PG, 2016
	Supplementary literature	- G.M. Fichtenholz : Rachunek różniczkowy i całkowy, t. 2, Wydawnictwo Naukowe PWN - W. Krysicki, L. Włodarski : Analiza matematyczna w zadaniach II, Wydawnictwo Naukowe PWN - W. Stankiewicz : Zadania z matematyki dla wyższych uczelni technicznych, Wydawnictwo Naukowe PWN
	eResources addresses	
Example issues/ example questions/ tasks being completed	Examine the convergence of series ... using the appropriate convergence criterion. Discuss the solvability of the given system of equations ... . Find local extrema of the given function f (x, y) = ... Using cylindrical or spherical coordinates, calculate the given triple integral ... Using the prediction method, solve the second order linear differential equations. Calculate the expected value and variance of the given random variable of the continuous type ..	
Practical activites within the subject	Not applicable	

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