GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematics, PG_00057670		
Field of study	Green Technologies		
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	125.0	240

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] has a basic knowledge from some branches of mathematics and physics useful for formulating and solving simple problems in the field of environmental technologies and modern analytical methods	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_K01] understands the need for learning throughout life, can inspire and organize the learning process of others. Is aware of his/her own limitations and knows when to ask the experts, can properly identify priorities for implementation, critically evaluate his knowledge	The student systematically plans and organizes their own work in order to achieve the intended learning outcomes, appreciates the value of teamwork in solving problems, cooperates effectively with others, and solves difficulties using available resources, which they are able to evaluate critically.	[SK5] Assessment of ability to solve problems that arise in practice
[K6_U03] is able to use information and communication technologies relevant to the common tasks of engineering, is able to use known methods and mathematical-physical models to describe and explain phenomena and chemical processes	The student is able to use information and communication technologies for active participation in discussions, cooperation in solving tasks, is able to use selected programs for calculations and is critical about the assessment of online resources.	[SU4] Assessment of ability to use methods and tools

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%
Exam written and/or 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; - E. Mieloszyk : Macierze, wyznaczniki i układy równań, Wydawnictwo PG, 2000; - M. Bednarczyk, A. Dąbrowicz-Tlałka: Elementy rachunku prawdopodobieństwa w zadaniach, Wydawnictwo PG, 2012
	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 - R. Leitner, Zarys matematyki wyższej II, Wydawnictwo Naukowo-Techniczne - W. Stankiewicz : Zadania z matematyki dla wyższych uczelni technicznych, Wydawnictwo Naukowe PWN
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Check the convergence of the series ... and determine its type. 2. Discuss the solvability of the given system of equations ... . 3. Find local extrema of the given function f (x, y) = ... 4. Using a double or triple integral, find the volume of a solid bounded by surfaces.... 5. Determine the potential of the vector field... 6. Using the prediction method, solve the first and second order linear differential equations. 7. 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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