GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematics, PG_00054686		
Field of study	Biotechnology		
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 Anita Dąbrowicz-Tlałka	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	45.0	45.0	0.0	0.0	0.0	90

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	90	10.0	125.0	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_U01	Student uses gained knowledge in basic mathematics to analyse results of experiments .	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
K6_W01	Student examines the convergence of the number series. Student defines basic notions of matrix calculus. Student uses basic notions and formulas of matrix calculus in solving systems of linear equations. Student analisies properties of a given function of two variables using differentional calculus of several variables functions. Student uses double and triple integral in geometrical applications. Student determines gradient, divergence and rotation as well as field potential. Student demonstrates some chosen techniques of solving ordinary differential equations. Student gives the definition of basic notions of probability theory. Student describes the basic types of distributions of random variable.	[SW1] Assessment of factual knowledge

Subject contents	Course content – lecture Providing theoretical knowledge, linking it to material already covered, and analyzing examples of the use of knowledge and skills in tasks related to: Number series: Convergent and divergent series. Convergence tests of the number series. Elements of linear algebra: 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 patterns. The rank of the main and completed matrix. Kronecker-Capelli theorem. Functions of two variables: Partial derivatives. Total 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 order n with constant coefficients. 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 Tasks involving the selection of criteria for determining the convergence or divergence of numerical series. Using matrix properties and matrix operations to solve matrix equations and calculate determinants. Exercises in applying the properties of vectors, scalar products, vector products, and mixed products. Determining methods for solving systems of linear equations using Cramer's formulas, Kronecker-Capelli's theorem, and Gauss's elimination method. Exercises in determining partial derivatives, calculations in the field of applications (extrema and gradient, divergence, rotation, potential). Tasks related to calculating double integrals, representing areas in polar coordinates, solving tasks from selected applications of double integrals. Solving ordinary differential equations - general and specific solutions, Cauchy's initial value problem. Correct identification of the type of equation and application of the appropriate method: equations with separated variables, first-order linear differential equations, second-order linear differential equations with constant coefficients. Exercises in determining probability distribution functions, distributives for discrete and continuous random variables. Determining probability, expected value, variance, and standard deviation. Examples of random variables and their distributions.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
class work	0.0%	10.0%
midterm tests	0.0%	40.0%
written exam	50.0%	45.0%
oral exam	50.0%	5.0%

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, Wdawnictwo 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 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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