GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematics 2, PG_00061675						
Field of study	Recycling and Energy Recovery						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2024/2025			
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	6.0			
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 Krzysztof Radziszewski				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	40.0	0.0	0.0	0.0	70
	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	70	5.0	75.0	150

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_W01] demonstrates knowledge and understanding of mathematics and other exact sciences and engineering disciplines at the level necessary to solve theoretical, engineering and technological problems and issues.	Student lists geometrical applications of definite integrals. Student distinguishes between types of improper integrals. Student solves matrix equations and systems of linear equations. Student analyses a tasks from analitycal geometry. Student computes partial derivatives and uses differential calculus to examine properties of the function of several variables. Student solves ordinary differential equations, including the use of information about complex numbers. Student computes multiple integrals and uses integral calculus to geometric and mechanics applications. Student studies canvergence of number series.	[SW1] Assessment of factual knowledge
[K6_U01] applies knowledge of mathematics and other exact sciences and engineering disciplines to solve theoretical, engineering and technological problems and issues.	Student uses definite integral to solve geometrical tasks. Student solves matrix equations and systems of linear equations. Student analyses a tasks from analitycal geometry. Student computes partial derivatives and uses differential calculus to examine properties of the function of several variables. Student solves ordinary differential equations, including the use of information about complex numbers. Student computes multiple integrals and uses integral calculus to geometric and mechanics applications. Student studies canvergence of number series.	[SU1] Assessment of task fulfilment

Subject contents

Definite integrals in Riemanns sense: Newton-Leibniz Thorem. Integration formulas, the substitution method of integration and integration by parts for definite integrals. Applications of integral calculus in computing areas of plane figures, lengths of arcs, volumes of solids of revolution. Elements of linear algebra: Matrices, their properties and arithmetics. Determinants. Inverse of a square matrix. Analytic geometry: Basic vectors definitions and properties.. 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. 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. Implicit functions. 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. Non-homogeneous linear differential equations. Higher order linear differential equations with constant coefficients. Double integrals. Applications of multiple integrals. Number series. Convergent and divergent series. Convergence tests of the number series.

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	50.0%	40.0%
exam	50.0%	60.0%

Recommended reading

Basic literature	J. Dymkowska, D. Beger, Rachunek całkowy w zadaniach, PG, Gdańsk 2015. E. Mieloszyk, Macierze, wyznaczniki i układy równań, PG, Gdańsk 2003. K. Jankowska, T. Jankowski, Funkcje wielu zmiennych. Całki wielokrotne. Geometria analityczna, PG, Gdańsk 2005. K. Jankowska, T. Jankowski, Zadania z matematyki wyższej, PG, Gdańsk 1999. W. Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych, Wydawnictwo Naukowe PWN, Warszawa 1995.

	Supplementary literature	T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1 Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2002. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1 Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2002 E. Mieloszyk, Liczby zespolone, PG, Gdańsk 2003. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2003. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2003. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne , Oficyna Wydawnicza GiS, Wrocław 2001. R. Leitner, Zarys matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 2001. R. Leitner, W. Matuszewski, Z. Rojek, Zadania z matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 1999. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach I i II, Wydawnictwo Naukowe PWN, Warszawa 1998. R. Leitner, J. Zacharski, Zarys matematyki wyższej II, Wydawnictwa Naukowo-Techniczne, Warszawa 2005. R. Leitner, J. Zacharski, Zarys matematyki wyższej III, Wydawnictwa Naukowo-Techniczne, Warszawa 2005. W. Żakowski, M. Kołodziej, Matematyka - część III, Wydawnictwa Naukowo-Techniczne, Warszawa 1963.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Find the area between the two curves y=ex and y=3-ex from x=-2 to x=0. 2. Discuss the existence of the solution for the given system of linear equations: 2x+y+z=2, x+3y+z=5, x+y+5z=-7, 2x+3y-3z=14. 3. Discuss the relation between two given lines l_1 : x=1+2t, y=-2-3t, z=5+4t and l_2 : x=7+3t, y=2+2t, z=1-2t . 4. Compute partial differentials of the second order for the given function $f(x,y) = xe^y + \cos 2x - x^2 \ln y$. 5. Find extreme values of the function $f(x,y)=2x^3-xy^2+5x^2+y^2$. 6. Compute the double integral of the given function $f(x,y)=x^2y$ over the region D: $x=-y^2$, y=1/x, y=-2. 7. Find a particular solution of the differential equation $y' \cos x - y \sin x = \cos^2 x$ satisfying the given initial conditions y(0)=1. 8. Find the general solution of the differential equation $y'' + 2y' = 12e^{-2x}$. 9. Check whether the given series is convergent with general term an=1/n tg(1/n3), bn=n!/nn , cn=1/n ln n, using the ratio test, the root test. the comparison test or the integral test.	
Work placement	Not applicable	