GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematics II, PG_00059245
Field of study	Civil Engineering

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**	5.0
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 Jolanta Dymkowska
	Teachers	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	30.0	0.0	0.0	0.0	60
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	60	6.0	59.0	125

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] Demonstrate knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering at a level necessary to achieve the other programme outcomes.	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, using informations about complex numbers. Student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in future.	[SW1] Assessment of factual knowledge
[K6_U01] Apply knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering to solve engineering problems and issues.	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, using informations about complex numbers. Student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in future.	[SU1] Assessment of task fulfilment

Subject contents	Elements of linear algebra: Matrices, their properties and arithmetics. Determinants. Inverse of a square matrix. Analytic geometry: Basic vectors definitions and properties. Eigenvectors and Eigenvalues. 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. 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.
Prerequisites and co-requisites	No requirements

Assessment methods and criteria

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

Recommended reading

Basic literature	J. Dymkowska, D. Beger, Rachunek różniczkowy w zadaniach, PG, Gdańsk 2016 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
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
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. Find A^{-1} if the matrix A is a 2x2 matrix of the elements $a_{ij} = 3i - j$. 2. Find the distance between lines l: $(x-9)/4 =(y+2)/(-3)=z$ and k: $x/(-2)=(y+7)/9=(z-2)/2$. 3. Sketch the graph of the function $f(x,y)=(9-x^2-y^2)^{1/2}$. 4. Identify any local extrema of the function $f(x,y)=e^{x-y}(x^2-2y^2)$. 5. Find the absolute extrema of the function $f(x,y)=xy-x(x+1)-y(y+1)$ on the set D={(x,y): $x^2+y^2\le25$, $y\le3$}. 6. Solve the equation $y''+6y'+9y=10\sin x$.
Work placement	Not applicable