GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematics_I, PG_00059252		
Field of study	Civil Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	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 Krzysztof Radziszewski	
	Teachers	dr Krzysztof Radziszewski dr Marcin Szyszkowski	

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	10.0	155.0	225

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 defines basic notions of matrix calculus. Student calculates determinants of any degree . Student describes methods of solving systems of linear equations Student analyses a tasks from analitycal geometry. Student solves equations and inequalities with elementary functions. Student determines intervals of monotonicity of a given functions and its extrema. Student geometrically interprets the results of an examinations of a graph of a functions using concept of limit, continuity and derivatives of functions. Student applies the basic rules and techniques of integration to calculate indefinite integrals	[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 problems using mathematical virtual laboratories.	[SU1] Assessment of task fulfilment

Subject contents	Matrices (definition, types of matrices, matrix operations). Determinants and their properties. Rank of a matrix. Inverse of a square non-singular matrix. Systems of linear equations. Cramers theorem. Kronecker-Capelly theorem. Gauss-Jordan elimination. Basic vectors definitions and properties. Dot product, cross product, their properties and its applications.The triple scalar product and applications. Equations of lines and planes in 3-space. The distance from a point to a plan. Angles between planes and lines. Functions of one variable and their properties: The absolute value function definition, solving equations and inequalities with absolute value, graphs of functions with absolute value. Power functions solving power and polynomial equations and inequalities. Rational functions solving national equations and inequalities. Exponential function properties and graphs, solving exponential equations and inequalities. Logarithmic functions properties and graphs, solving logarithmic equations and inequalities. Trigonometric and cyclometric functions properties and graphs, solving trigonometric equations and inequalities. Limits and continuity: Infinite sequences. Fundamental definitions of limit of sequence, convergence and divergence, limit theorems. Applications to solving equation. Differential calculus of functions with one variable and applications of differential calculus of functions with one variable: Definition of first derivative and differential. Rolls and Lagranges theorems. Higher derivatives and differentials. Monotonicity and local extrema. Convexity, concavity and inflexion points of a function. De lHospitals Thorem. Asymptotes. Applying differential calculus to studying the properties of functions with one variable. Inegral calculus of functions with one variable antiderivatives: The process of finding antiderivatives and integration formulas the substitution method of integration and integration by parts. Integration of rational, trigonometric and irrational functions.
Prerequisites and co-requisites	

Assessment methods and criteria

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

Recommended reading

Basic literature	1. Praca zbiorowa pod redakcją B. Wikieł, Matematyka - Podstawy z elementami matematyki wyższej, PG, Gdańsk 2007. 2. K. Jankowska, T. Jankowski, Zbiór zadań z matematyki, PG, Gdańsk 1997. 3. Praca zbiorowa pod red. E. Mieloszyka, Matematyka Materiały pomocnicze do ćwiczeń, PG, Gdańsk 2004. 4. R. Leitner, Zarys matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 2001. 5. R. Leitner, W. Matuszewski, Z. Rojek, Zadania z matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 1999. 6. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2001.
Supplementary literature	7. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2001. 8. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach I i II, Wydawnictwo Naukowe PWN, Warszawa 1998. 9. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1 Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2002. 10. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1 Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2002. 11. E. Mieloszyk, Macierze, wyznaczniki i układy równań, PG, Gdańsk 2003.
eResources addresses	Podstawowe https://enauczanie.pg.edu.pl/moodle/course/view.php?id=24311 - Compulsory course for the subject.

Example issues/ example questions/ tasks being completed

1. Find the domain and the set of values of the function f(x)=arcsin(3x-2)+. Determine the inverse function of f.
2. Find the derivative of $y=4x(3x^2+5)^5$.
3. Sketch the graph of the function f(x)=x-lnx. Identify any local extrema and points of inflection.
4. Find the absolute extrema of $f(x)=4x-36x^{-1}$ on the interval [1,6].
5. Calculate $4x^{-1}$ lnx dx.
6. Find A^{-1} if the matrix A is a 2x2 matrix of the elements $a_{ij} = 3i - j$.
7. Find the distance between lines *l*: (x-9)/4 =(y+2)/(-3)=z and *k*: x/(-2)=(y+7)/9=(z-2)/2.

Work placement

Not applicable