GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematics I, PG_00055363						
Field of study	Mechatronics						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2025/2026			
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	1		ECTS credits	10.0			
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 Stanisław Domachowski				
	Teachers						
Lesson types and methods of instruction	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		24.0	121.0	250	
Subject objectives	The aim of this subject is for the student to obtain the competence in the range of using 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 knowledge in the field of mathematics that include vector and matrix calculus, analytical geometry, mathematical analysis (including ordinary and partial differential equations) and elements of discrete and applied mathematics, including mathematical and numerical methods essential to: 1) description and analysis od stationary, continuous and discrete mechatronics systems as well as basic physical phenomena that occur there; 2) description and analysis od programmable mechatronic systems; 3) description and analysis for signal processing; 4) synthesis of mechatronics elements and systems	Student names basic properties of elementary functions. Student solves equations and inequalities with elementary functions. Student evaluates the limits of sequences. Student explains the concept of limit and continuity of functions. Student defines basic concepts of differential calculus of one variable. Student analyses properties of a functions on the basis of an examination of its first and second derivatives. Student geometrically interprets results of an examination of a graph of a function using the concept of limit,continuity and derivatives of functions. Student applies basic rules and techniques of integration to calculate indefinite integrals. Student lists geometrical applications of definite integrals. Student distinguishes between types of improper integrals. Student performs calculations on complex numbers. Student defines basic notions of matrix calculus. Student calculates determinants of any degree. Student determines eigenvalues of matrices.	[SW1] Assessment of factual knowledge
[K6_U01] is able to acquire information from literature, databases and other, properly chosen sources, integrate these information, interpret them, draw conclusions and formulate opinions	Student combines knowledge of mathematics with knowledge from other fields.	[SU2] Assessment of ability to analyse information
[K6_U03] has self-learning skills	Student recognizes the importance of self-expanding knowledge.	[SU1] Assessment of task fulfilment

Subject contents

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 rational 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. Infinite sequences. Definition of a limit of a sequence, convergence and divergence, limit theorems. Limit of a function at a point, right-side limit of a function, left-side limit of a function, improper limit. Continuous function at a point, continuity of an inverse function. Differential calculus of one variable functions and its applications: Definition of a 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 l'Hospitals Thorem. Asymptotes. Applying differential calculus to studying the properties of one variable functions. Integral calculus of one variable functions 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. 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. Improper integrals, applications of improper integrals. Complex numbers. Matrices, matrix operations, matrix inversion, determinants, rank of a matrix. Eigenvalues of the matrix. System of linear equations. Cramers theorem. Kronecker Capelli theorem. Gauss Jordan elimination method.

Prerequisites and co-requisites

No recomendations

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
written exam 90 minutes, tests, e-test, • Active participation during classes	50.0%	100.0%

Recommended reading	Basic literature	W.Żakowski, G.Decewicz , Matematyka czesc 1 Analiza Matematyczna, Wydawnictwa Naukowo- Techniczne, Warszawa 1991, B.Wikieł, Matematyka, Podstawy z elementami matematyki wyższej, Wydawnictwo Politechniki Gdańskiej Gdańsk 2009, W. Krysicki, L. Włodarski Analiza matematyczna w zadaniach PWN, Warszawa 1986 W. Stankiewicz Zadania z matematyki dla wyższych uczelni technicznych, PWN, Warszawa 1980, K.Jankowska, J.Jankowski, Zbiór zadań z matematyki, Wydawnictwo Politechniki Gdańskiej Gdańsk 2003, J Dymkowska, D. Beger Rachunek całkowy w zadaniach, Wydawnictwo Politechniki Gdańskiej 2015, J Dymkowska, D. Beger Rachunek różniczkowy w zadaniach, Wydawnictwo Politechniki Gdańskiej 2016.
	Supplementary literature	W. Jankowski Matematyka. Podręcznik dla wydziałów elektrycznych i mechanicznych politechnik, PWN, Warszawa 1967 W. Leksiński, I. Nabiałek, W. Żakowski Matematyka. Definicje, twierdzenia, przykłady, zadania-podręczniki akademickie , Wyd. NT, Warszawa 1994, K.Dobrowolska, praca zbiorowa Matematyka dla studiów technicznych dla pracujących Tom I, PWN, Warszawa 1981, R. Grzymkowski Matematyka, zadania i odpowiedzi, podręczniki akademickie, Wyd. Pracowni Komputerowej Jacka Skalmierskiego, Gliwice 2002 M. Gewert, Z. Skoczylas Analiza matematyczna 1, Przykłady i zadania, Oficyna Wydawnicza Gis, Wrocław 2005 , T.Jurlewicz, Z.Skoczylas Algebra liniowa 1 Przykłady i zadania ", Oficyna Wydawnicza Gis, Wrocław 2004 ,J. Głazunow Matematyka wyższa, zbiór zadań z analizy funkcji jednej zmiennej, Wyd. Elbląskiej Uczelni Humanistyczno-Ekonomicznej, Elbląg 2006 M. Lassak Zadania z analizy matematycznej, Wyd. Wspierania Procesu Edukacji, Warszawa 2003.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1.Find the domain and range of the function f(x)=... . Determine the inverse function of f 2.Evaluate the limit of the given sequence an=(3n2+6n)½-3½n. 3. Evaluate the limit of the given function f(x)= at the point x0= 4. Using the rules of differentiation find the derivative of the following function f(x)= . 5. Evaluate the indefinite integral of the given rational function f(x)=(x+3) (x3 +3x2 +4x+2). 6. Sketch the graph of the function f(x)= . Identify any local extrema and inflection points. 7. Determine indefinite integrals of the following functions using the method of integration by parts or the method of substitution. 8. Find the volume of a solid of revolution obtained by rotating the graph of the function f(x)= about the OXaxis. 9. Find the area of the surface obtained by rotating the arc y=f(x) about the OX-axis. 10. Discuss the existence of solutions of the given system of linear equations. 11.Find all eigenvalues of the matrix A	
Work placement	Not applicable	

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