GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

<table>
<tr><td>Subject name and code</td><td colspan="6">Mathematics I, PG_00055371</td></tr>
<tr><td>Field of study</td><td colspan="6">Mechanical Engineering</td></tr>
<tr><td>Date of commencement of studies</td><td colspan="2">October 2024</td><td colspan="2">Academic year of realisation of subject</td><td colspan="2">2024/2025</td></tr>
<tr><td>Education level</td><td colspan="2">first-cycle studies</td><td colspan="2">Subject group</td><td colspan="2">Obligatory subject group in the field of study</td></tr>
<tr><td>Mode of study</td><td colspan="2">Full-time studies</td><td colspan="2">Mode of delivery</td><td colspan="2">at the university</td></tr>
<tr><td>Year of study</td><td colspan="2">1</td><td colspan="2">Language of instruction</td><td colspan="2">Polish</td></tr>
<tr><td>Semester of study</td><td colspan="2">1</td><td colspan="2">ECTS credits</td><td colspan="2">10.0</td></tr>
<tr><td>Learning profile</td><td colspan="2">general academic profile</td><td colspan="2">Assessment form</td><td colspan="2">exam</td></tr>
<tr><td>Conducting unit</td><td colspan="6">Mathematics Center -> Vice-Rector for Education</td></tr>
<tr><td rowspan="2">Name and surname of lecturer (lecturers)</td><td colspan="2">Subject supervisor</td><td colspan="4">dr Stanisław Domachowski</td></tr>
<tr><td colspan="2">Teachers</td><td colspan="4">dr Stanisław Domachowski
dr Leszek Ziemczonek
mgr Mariusz Kaczmarek</td></tr>
<tr><td rowspan="3">Lesson types and methods of instruction</td><td>Lesson type</td><td>Lecture</td><td>Tutorial</td><td>Laboratory</td><td>Project</td><td>Seminar</td><td>SUM</td></tr>
<tr><td>Number of study hours</td><td>45.0</td><td>60.0</td><td>0.0</td><td>0.0</td><td>0.0</td><td>105</td></tr>
<tr><td colspan="7">E-learning hours included: 0.0</td></tr>
<tr><td rowspan="2">Learning activity and number of study hours</td><td>Learning activity</td><td colspan="2">Participation in didactic classes included in study plan</td><td>Participation in consultation hours</td><td>Self-study</td><td>SUM</td></tr>
<tr><td>Number of study hours</td><td colspan="2">105</td><td>22.0</td><td>123.0</td><td>250</td></tr>
<tr><td>Subject objectives</td><td colspan="7">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.</td></tr>
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Learning outcomes	<table><tr><th>Course outcome</th><th>Subject outcome</th><th>Method of verification</th></tr><tr><td>[K6_U01] is able to acquire information from specialized literary sources, databases and other resources, essential for solving engineering tasks; is able to compile the obtained information pieces and to interpret them, additionally is able to form conclusions and present justified opinion</td><td>Student combines knowledge of mathematics with knowledge from other fields.</td><td>[SU2] Assessment of ability to analyse information</td></tr><tr><td>[K6_W01] possesses mathematical knowledge within the range of linear algebra and mathematical analysis useful in characterising and interpreting mechanical systems, technological processes and operational properties of devices</td><td>Student defines the basic concepts of differential calculus of one variable. Student analyses the properties of functions on the basis of an examination of its first and second derivatives. Student geometrically interprets the results of an examination of a graph of a function using the concept of limit, continuity and derivatives of functions. Student applies the 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.</td><td>[SW1] Assessment of factual knowledge</td></tr></table>
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	
Assessment methods and criteria	<table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>written exam 90 minutes, tests, etest, • Active participation during classes</td><td>50.0%</td><td>100.0%</td></tr></table>
Recommended reading	<table><tr><td>Basic literature</td><td>W.Żakowski, G.Decewicz , Matematyka część 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 część I, PWN, Warszawa 1986 W. Stankiewicz Zadania z matematyki dla wyższych uczelni technicznych, cz.I, PWN, Warszawa 1980,K.Jankowska, J.Jankowski, Zbiór zadn z matematyki, Wydawnictwo Politechniki Gdańskiej Gdańsk 2003. J.Dymkowska, D. Beger Rachunek całkowy w zadaniach" Wydawnictwo Politechniki Gdańskiej Gdańsk 2015, J.Dymkowska, D. Beger Rachunek różniczkowy w zadaniach" Wydawnictwo Politechniki Gdańskiej Gdańsk 2015,</td></tr></table>

	Supplementary literature	A. Kiełbasa "Matematyka Matura 2009 Matura 2010 poziom podstawowy i rozszerzony" cz. I i II, Wyd. "2000", Warszawa 2008 Z. Cewe, J. Kobierowska, H. Nahorska, I. Stepuro, J. Witkowska "Matura z matematyki od roku 2010", Zbiór zadań maturalnych z zakresu kształcenia rozszerzonego, Wydawnictwo "Podkowa", Gdańsk 2010W. 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 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	