



Subject card

Subject name and code	Mathematics 2, PG_00042017						
Field of study	Power Engineering						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
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			English		
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 Hanna Guze				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	45.0	0.0	0.0	0.0	90
	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	90	15.0		45.0		150
Subject objectives	Students obtain competence in using methods of mathematical analysis and differential equations, and knowledge how to solve simple problems that are found in the field of engineering.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U02] is able to apply the learned mathematical methods to the analysis and design of elements, systems and energy systems		Student combines knowledge of mathematics with knowledge from other fields.		[SU3] Assessment of ability to use knowledge gained from the subject		
	[K6_K01] is aware of the need for training and self-improvement in the profession of energy and the possibility of further education; can think and act in a creative and entrepreneurial manner; can define priorities for the implementation of an individual or group task		Student understands that to use a specific math tool, he needs to reach for additional knowledge in given subject. Student recognizes the importance of self-expanding knowledge and takes the challenge of working with a group to solve a problem.		[SK2] Assessment of progress of work		
	[K6_W01] has basic knowledge of mathematics necessary to describe the phenomena related to the processes of energy conversion and transfer; uses information technology to solve mathematical problems		Student analyses properties of a given function of two variables using differential calculus of multivariable functions. Student evaluates the limits of sequences, radius and interval of convergence of a power series. Student is able to determine the type of convergence of a number series. Student evaluates double and triple integrals and explains the methods of change of variables. Student knows various types of differential equations and selects the appropriate methods to solve them. Students explains the definition of the cross product. Student evaluates line integrals.		[SW1] Assessment of factual knowledge		

Subject contents	<p>Course content – lecture</p> <p>Indefinite integral.</p> <p>Definite and improper integral and their applications.</p> <p>Complex numbers: algebraic and trigonometric form, complex conjugate, modulus, arithmetic operations, root of complex numbers, solving equations.</p> <p>Infinite number series: necessary condition for convergence, criteria for convergence, alternating series, conditional and absolute convergence.</p> <p>Power series.</p> <p>Analytic Geometry: vectors (dot product, cross product, mixed product, and their application), equations of line and planes in space.</p> <p>Conic sections and graphs of selected surfaces.</p> <p>Multivariable Functions: limits and continuity, partial derivatives with applications.</p> <p>Integrals of multivariable functions: double integrals (definition, polar coordinates, application in geometry and physics), triple integrals (definition, cylindrical and spherical coordinates, application in geometry and physics).</p> <p>Ordinary Differential Equations: separable, homogeneous, Bernoulli, first order linear equations, linear of order n with constant coefficients, variation of parameters and undetermined coefficients method.</p> <p>Elements of field theory: scalar and vector fields. Gradient, divergence, rotation.</p> <p>Line integral of a scalar field and a vector field.</p>
	<p>Course content – exercises</p> <p>Indefinite and definite integrals: reminder of basic integration methods, applications of definite integral in geometry.</p> <p>Improper integral and their application.</p> <p>Convergence criteria for number series. Conditional and absolute convergence. Power series.</p> <p>Basic operations with complex numbers. Solving equations in the set of complex numbers.</p> <p>Application of scalar, vector, and mixed products in geometry. Equations and graphs of planes and selected surfaces in three-dimensional space.</p> <p>Calculation and application of partial derivatives of functions of several variables. Analysis of the properties of functions of several variables using local and global extrema.</p> <p>Conversion of double and triple integrals to iterated integrals. Application of double and triple integrals in geometry. Application of polar, cylindrical, and spherical coordinates.</p> <p>Solving first-order and higher-order linear differential equations with constant coefficients using the method of variation of parameters and undetermined coefficients.</p> <p>Gradient of a scalar field, divergence and rotation of a vector field and line integrals.</p>

Prerequisites and co-requisites	Working knowledge of the concepts of the first semester of mathematics.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final Exam	45.0%	50.0%
	Tests and activity in classes	0.0%	50.0%
Recommended reading	Basic literature	<p>Sherman K. Stein, Calculus and analytic geometry, McGraw - Hill Book Company, 4th edition, 1987.</p> <p>Howard Anton, Calculus. A new horizon., John Wiley and Sons Publishing Company, 6th edition, 1999.</p> <p>D.J. Hartfiel, Arthur M. Hobbs, Elementary linear algebra, Prindle, Weber & Schmidt, Boston, 1987.</p> <p>T. Jankowski, Linear algebra, Wydawnictwo Politechniki Gdańskiej, Gdańsk, 2001.</p> <p>K. Jankowska, T. Jankowski, "Zbiór zadań z matematyki", cz. 2 i 3, PG Gdańsk.</p>	
	Supplementary literature	<p>M.Gewert, Z.Skoczylas, Analiza matematyczna II, wzory, Oficyna Wydawnicza GiS</p> <p>E.Lobos, B.Sikora, Calculus and differential equations in exercises, The Publishing House of the Silesian University of Technology, Gliwice, 2006.</p> <p>J.Polking, A.Boggess, D.Arnold, Differential Equations, Pearson</p>	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Find the general solution of the differential equation. 2. Determine convergence of the series. 3. Find local extreme values of the function $f(x,y)=\dots$ 4. Find the volume of the given solid by means of double or triple integral. 5. Find the roots of the given complex number. 6. Sketch the graph of the following surface. 		
Practical activities within the subject	Not applicable		

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