



Subject card

Subject name and code	Mathematics 2, PG_00055876						
Field of study	Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2021/2022		
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			8.0		
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 Marcin Szyszkowski				
	Teachers		mgr Danuta Beger dr Marcin Szyszkowski dr Magdalena Musielak				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	45.0	0.0	15.0	0.0	90
	E-learning hours included: 0.0						
Energetyka 2 - Matematyka 2021/22 (M.Szyszkowski, D.Beger) - Moodle ID: 22361 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22361							
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		12.0		98.0	200
Subject objectives	Student obtains competence in the range of using methods of mathematical analysis and linear algebra and skills to solve simple problems that can be found in the field of engineering.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	<p>[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</p>	<p>Student performs calculations on complex numbers. Student determines the real and complex roots of polynomials. Student examines complex functions. Student determines the real and imaginary parts of functions of a complex variable.</p> <p>Student evaluates limits of a function of two variables. Student calculates partial derivatives of a function of two variables. Student determines a tangent plane to the graph of a function of two variables. Student determines local and global extrema of functions of two variables. Student calculates double integrals, and explains the method of substitution in the double integral. Student applies double integrals to solving geometrical problems. Student calculates triple integrals.</p> <p>Student knows what is a convergent/divergent series (also for complex numbers). Knows types of convergence (conditional and absolute). Knows some criteria of determining convergence/divergence of a series. Can determine the radius of convergence of functional series.</p> <p>Student determines general and particular solutions of certain types of the first-order differential equations. Student finds the right method for solving ordinary differential equations. Student determines fundamental set of solutions of the homogeneous linear equation of order n with constant coefficients. Student determines general and particular solutions of higher orders linear differential equations with constant coefficients. Student determines general and particular solutions of systems of differential linear equations. Student determines general and particular solutions of a first-order partial linear differential equations. Student calculates line integrals.</p> <p>Student can compute some line integrals. presents the application of line integrals.</p> <p>Student uses mathematical packages (matlab) to perform calculations and visualization of mathematical concepts.</p>	<p>[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation</p>
	<p>[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</p>	<p>Student recognizes the importance of self-expanding knowledge and takes the challenge of working with a group to solve a problem. Student understands the need of lifelong learning. Student is able to inspire others and organize their learning process.</p>	<p>[SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness</p>

	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 solves text exercises. For example the closes point on a given curve or a surface. Computes total force acting on a dam (or other 2 dimensional objects).	[SU3] Assessment of ability to use knowledge gained from the subject
Subject contents	<p>Integral calculus of functions of one variable</p> <ul style="list-style-type: none"> Definite integrals and their applications. Improper integrals. <p>Complex numbers</p> <ul style="list-style-type: none"> Algebraic, trigonometric and exponential form of a complex number Operations on complex numbers Factorizing real polynomials using complex numbers <p>Integral calculus of functions of several variable</p> <ul style="list-style-type: none"> Functions of two variables. The differential calculus. The double and triple integrals. Line integral of a scalar field, line integral of a vector field Surface integral, flux integral <p>Series</p> <ul style="list-style-type: none"> Types of convergence (conditional/absolute) (including series of complex numbers) Radius of convergence for power series <p>Ordinary differential equations</p> <ul style="list-style-type: none"> Ordinary first order differential equations Higher order linear differential equations with constant coefficients. Systems of linear differential equations . 		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	50.0%	40.0%
	Midterm colloquium	50.0%	50.0%
	pytania na zajęciach	0.0%	10.0%
Recommended reading	Basic literature	Bibliography	
		<ol style="list-style-type: none"> Kurs internetowy https://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx Żakowski W., Leksiński W., <i>Matematyka cz. IV</i>, Wydawnictwo Naukowo-Techniczne, Warszawa, 1971 	
	Supplementary literature	Supplementary Bibliography	
		<ol style="list-style-type: none"> Fichtenholtz, G. M., <i>Rachunek różniczkowy i całkowy, t. 1-2</i>, PWN Warszawa 1962 Jankowska K., Jankowski T., <i>Zbiór zadań z matematyki</i>, Wydawnictwo PG Gdańsk 1998 Krysicki W., Włodarski L., <i>Analiza matematyczna w zadaniach, cz. II</i>, PWN Warszawa 1994 Pogorzelski W., <i>Analiza matematyczna, t. 2-3</i>, PWN Warszawa 1956 	
	eResources addresses	Podstawowe https://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx - Calculus course with examples at Lamar Univ.	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> Find the volume/area of a rotational solid (defined by revolving the graph of a given function). Raise a given complex number to a big power, find a root (eg. of 4-th degree) from a given number. Find the extremum of the given function of the two variables (including text exercises) Find max/min of a given two variable function defined on a compact set (eg. disc) Find the volumes of the given solids by means of double integral (or by means of triple integral). Solve a differential equation of first degree) (eg. linear or homogeneous) Solve a system of linear diff. equations. Compute the line integral. 		
Work placement	Not applicable		