



## Subject card

Subject name and code	Mathematics 2, PG_00042017						
Field of study	Power Engineering, Power 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	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 Marcin Szyszkowski				
	Teachers		dr Marcin Szyszkowski				
Lesson types and methods of instruction	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		The student uses mathematical methods to analyze and design energy elements. Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions.		[SU3] Assessment of ability to use knowledge gained from the subject		
	[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 combines knowledge of mathematics with knowledge from other fields.		[SW1] Assessment of factual knowledge		
	[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.		[SK2] Assessment of progress of work		

Subject contents	<p>Definite integrals</p> <ul style="list-style-type: none"> <li>• area and volume of revolving figures</li> <li>• center of mass of plane figures</li> </ul> <p>Complex numbers</p> <ul style="list-style-type: none"> <li>• adding, multiplying, dividing</li> <li>• trigonometric form of a complex number</li> <li>• finding roots and powers of numbers (in trig form)</li> </ul> <p>Double variable functions</p> <ul style="list-style-type: none"> <li>• continuity, directional derivatives,</li> <li>• extremums, saddle points</li> <li>• double integral</li> <li>• polar coordinates</li> </ul> <p>Multivariable Calculus</p> <ul style="list-style-type: none"> <li>• triple variable functions</li> <li>• triple integral</li> <li>• cylindrical and spherical coordinates</li> </ul> <p>Series</p> <ul style="list-style-type: none"> <li>• monotonicity, boundedness, convergence</li> <li>• convergence tests</li> </ul> <p>Function series:</p> <ul style="list-style-type: none"> <li>• power series, radius of convergence</li> <li>• examples of Taylor's and MacLaurent series</li> </ul> <p>Ordinary differential equations:</p> <ul style="list-style-type: none"> <li>• separable equations, linear equations, homogenous equations</li> <li>• Linear equations of constant coefficients (homogenous and not)</li> </ul>		
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
	Tests	50.0%	65.0%
	Final Exam	50.0%	35.0%
Recommended reading	Basic literature	<p>George B. Thomas, Jr., Ross L. Finney., Calculus and analytic geometry, Addison-Wesley Publishing Company; 7th edition (January 1988)</p> <p>Z.Michna, Mathematics, 2nd edition, Publishing House of Wrocław University of Economics, Wrocław, 2012.</p>	
	Supplementary literature	<p>M.Gewert, Z.Skoczylas, Analiza matematyczna II, wzory, Oficyna Wydawnicza GiS</p> <p>E.Łobos, 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	<p>Podstawowe</p> <p><a href="https://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx">https://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx</a> - Calculus II and III at Lamar University Beaumont, Texas</p> <p>Adresy na platformie eNauczanie:</p> <p>Mathematics Energy tech - Moodle ID: 26608</p> <p><a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26608">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26608</a></p>	

Example issues/ example questions/ tasks being completed	1. Solve the given differetial equation of the first order  2.Solve system of linear, constant coefficient diff. equations  3. Compute partial derivatives (and find critical points)  4. Find the extremum/saddle points of the given function of the two variables.  5. Find tangent plane to the graph of eg. $\sqrt{2x^2+y^2+5}$ , approximate $f(2,2 ; 6,2)$  5. Find the biggest and the smallest value of a function (two variables) on a disc/triangle  6. Find the volumes of the given solids by means of double integral (or by means of triple integral).  7. Find roots of third degree of the number $-2+2i$ , find $(\sqrt{3} + i)^{15}$  8. Find center of mass od a given lamina/solid (quarter of a circle, paraboloid)  9. Tell if a given series is convergent  10. Find interval of convergence for a given power series  11. Find first terms of McLaurent series for $f=\sin x \times e^y$
Work placement	Not applicable