



Subject card

Subject name and code	Mathematics II, PG_00044220						
Field of study	Engineering Management						
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	Polish				
Semester of study	2	ECTS credits	5.0				
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 Lech Kujawski					
	Teachers	dr Lech Kujawski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 0.0						
WZiE - Zarządzanie Inżynierskie - Matematyka II 2022/23 (M.Kujawski) - Moodle ID: 29881 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29881							
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	60	8.0	57.0	125		
Subject objectives	The aim of this subject is to obtain the students competence in the range of using the 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 management and economics.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	<p>[K6_W11] has the basic knowledge of mathematics, physics and chemistry necessary to solve technical problems</p>	<p>Student combines knowledge of mathematics with knowledge from other fields. Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions.</p> <p>Student names the basic rules and techniques of integration to calculate indefinite, definite and improper integrals. Student knows the methods of using definite integral to solve geometrical problems. Student names properties of a given function of two variables based of differential calculus of several variables functions. Student names properties of double integrals, and explains the method of substitution in the double integral. Student knows the methods of using double integrals to solve geometrical and economical problems. Student names some chosen techniques of solving ordinary differential equations. Student knows the definition of convergence of number series. Student knows the method of using power series in order to compute sums of number series. Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions.</p>	<p>[SW1] Assessment of factual knowledge</p>
	<p>[K6_U01] interprets and analyses the phenomena and processes taking place in the economy and organisation using basic theoretical knowledge of economics, management and science</p>	<p>Student applies the basic rules and techniques of integration to calculate indefinite, definite and improper integrals. Student uses definite integral to solve geometrical problems. Student analyses properties of a given function of two variables using differential calculus of several variables functions. Student calculates double integrals, and applies the method of substitution in the double integral and knows its basic applications. Student demonstrates some chosen techniques of solving ordinary differential equations. Student analyzes convergence of number series. Student uses power series in order to compute sums of number series.</p>	<p>[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information</p>

Subject contents	<p>The process of finding antiderivatives and integration formulas the methods of substitution and integration by parts. Integration of rational, trigonometric and irrational functions.</p> <p>Fundamental Theorem of Calculus. Methods of evaluations of definite integrals. Integration formulas, the methods of substitution and integration by parts for definite integrals. Improper integrals. Selected applications of definite integrals.</p> <p>Functions of two variables: Partial derivatives. Total differential. Taylors formula. Maxima and minima of a function of several variables.</p> <p>Integral calculus of functions of several variables - double integral . Iterated integrals. Change of variables in a double integral, polar coordinates.</p> <p>First order differential equations. Second order and higher order linear differential equations with constant coefficients.</p> <p>Number series: Convergent and divergent series. Convergence tests of the number series.</p> <p>Power series: Radius and interval of convergence of power series.</p>														
Prerequisites and co-requisites	Knowledge of the subject: Mathematics I.														
Assessment methods and criteria	<table border="1" data-bbox="448 822 1487 965"> <thead> <tr> <th data-bbox="448 822 794 860">Subject passing criteria</th> <th data-bbox="794 822 1141 860">Passing threshold</th> <th data-bbox="1141 822 1487 860">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 860 794 898">Midterm tests</td> <td data-bbox="794 860 1141 898">0.0%</td> <td data-bbox="1141 860 1487 898">44.0%</td> </tr> <tr> <td data-bbox="448 898 794 936">Written exam</td> <td data-bbox="794 898 1141 936">50.0%</td> <td data-bbox="1141 898 1487 936">50.0%</td> </tr> <tr> <td data-bbox="448 936 794 965">Class work</td> <td data-bbox="794 936 1141 965">0.0%</td> <td data-bbox="1141 936 1487 965">6.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Midterm tests	0.0%	44.0%	Written exam	50.0%	50.0%	Class work	0.0%	6.0%
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Recommended reading	Basic literature	<p>- Gurgul H., Suder M., Matematyka dla kierunków ekonomicznych, Oficyna a Wolters Kluwer business, Warszawa</p> <p>- Jankowska K., Jankowski T., Zbiór zadań z matematyki, Wydawnictwo PG, Gdańsk</p> <p>- Jankowska K., Jankowski T., Funkcje wielu zmiennych - Całki wielokrotne - Geometria analityczna, Wydawnictwo PG, Gdańsk</p>													
	Supplementary literature	<p>Banaś J., Podstawy matematyki dla ekonomistów, Wydawnictwa Naukowo-Techniczne, Warszawa</p> <p>Gewert M., Skoczylas Z., Analiza matematyczna 1, Przykłady i zadania, Wydawnictwo GiS, Wrocław</p> <p>Gewert M., Skoczylas Z., Analiza matematyczna 2, Definicje, twierdzenia wzory, Wydawnictwo GiS, Wrocław</p> <p>Gewert M., Skoczylas Z., Analiza matematyczna 2, Przykłady i zadania, Wydawnictwo GiS, Wrocław</p> <p>Sozański B., Dziedzic I., Algebra i analiza w zagadnieniach ekonomicznych, Wydawnictwo Biła, Rzeszów</p>													
	eResources addresses														

<p>Example issues/ example questions/ tasks being completed</p>	<p>Show the series convergence ... and find its sum.</p> <p>Find the integral of the rational function...</p> <p>Find the improper integral ... or demonstrate its discrepancy.</p> <p>Find the local extremes of the function $f(x, y) = \dots$</p> <p>Using the double integral, determine the area of the area delimited by the curves...</p> <p>Solve the differential equation using the constant variation method.</p> <p>Find the general solution of the third order differential equation ... using the prediction method.</p>
<p>Work placement</p>	<p>Not applicable</p>