



Subject card

Subject name and code	Mathematics II, PG_00044220						
Field of study	Engineering Management						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2020/2021		
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study		
Mode of study	Full-time studies		Mode of delivery		e-learning		
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 inż. Natalia Jarzębkowska				
	Teachers		dr inż. Natalia Jarzębkowska				
			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: 60.0						
	Adresy na platformie eNauczanie:						
	WZiE - ZI - Matematyka II 2020/2021 (N.Jarzębkowska) - Moodle ID: 13211 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13211 WZiE - ZI - Matematyka II 2020/2021 (N.Jarzębkowska) - Moodle ID: 13211 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13211 WZiE - ZI - Matematyka II 2020/2021 (N.Jarzębkowska) - Moodle ID: 13211 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13211						
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
	[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	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. Students calculates double integrals, and applies the method of substitution in the double integral. Student uses double integrals to solve geometrical and economical problems. 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. Student uses mathematical methods to solve technical problems.	[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
	[K6_W11] has the basic knowledge of mathematics, physics and chemistry necessary to solve technical problems	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. 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 pf 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.	[SW1] Assessment of factual knowledge
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. Applications of integral calculus in computing areas of plane figures, lengths of arcs, volumes of solids of revolution. Applications of definite integrals in economics. Improper integrals. Applications of improper integrals.</p> <p>Limit and continuity of a function of several variables. Partial derivatives. Maxima and minima of a function of several variables. Implicit functions. Integral calculus of functions of several variables. 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. Power series. Radius and interval of convergence. Taylors and Maclaurins series.</p>		

Prerequisites and co-requisites	Knowledge of the subject: Mathematics I.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Class activity	50.0%	20.0%
	Exam	50.0%	50.0%
	Midterm colloquium	50.0%	30.0%
Recommended reading	Basic literature	1. Gurgul H., Suder M., Matematyka dla kierunków ekonomicznych, Oficyna a Wolters Kluwer business, Warszawa 2. Jankowska K., Jankowski T., Zbiór zadań z matematyki, Wydawnictwo PG, Gdańsk 3. Jankowska K., Jankowski T., Funkcje wielu zmiennych - Całki wielokrotne - Geometria analityczna, Wydawnictwo PG, Gdańsk	
	Supplementary literature	1. Banaś J., Podstawy matematyki dla ekonomistów, Wydawnictwa Naukowo-Techniczne, Warszawa 2. Beger D., Dymkowska J., Rachunek całkowy w zadaniach, Wydawnictwo PG 3. Beger D., Dymkowska J., Rachunek różniczkowy w zadaniach, Wydawnictwo PG 4. Gewert M., Skoczylas Z., Analiza matematyczna 1, Przykłady i zadania, Wydawnictwo GiS, Wrocław 5. Gewert M., Skoczylas Z., Analiza matematyczna 2, Definicje, twierdzenia wzory, Wydawnictwo GiS, Wrocław 6. Gewert M., Skoczylas Z., Analiza matematyczna 2, Przykłady i zadania, Wydawnictwo GiS, Wrocław 7. Sozański B., Dziedzic I., Algebra i analiza w zagadnieniach ekonomicznych, Wydawnictwo Bila, Rzeszów	
	eResources addresses	Podstawowe https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13211 - e-learning course Matematyka II Uzupełniające WZiE - ZI - Matematyka II 2020/2021 (N.Jarzębkowska) - Moodle ID: 13211 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13211 WZiE - ZI - Matematyka II 2020/2021 (N.Jarzębkowska) - Moodle ID: 13211 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13211 WZiE - ZI - Matematyka II 2020/2021 (N.Jarzębkowska) - Moodle ID: 13211 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13211	
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none">• Prove convergence of the series and find the sum.• Is the given series absolutely convergent, conditionally convergent or divergent?• Compute the improper integral or prove its divergence.• Find the area of the figure bounded by $y=e^x$, $y=e^{2x}$, $x=1$.• Find the integral $x^3 \ln x \, dx$.• Find the points of extrema of the function $f(x,y)=x^2+xy+y^2+x-y+1$.• Find the greatest and the least value of the function $f(x,y)=x^2-y^2$ within the circle $x^2+y^2=4$. To find stationary points on the boundary of the domain use the method of relative extrema.• Find the area of the indicated domain using double integration. The domain is bounded by the parabolas $y=x$, $y=2x$ and straight line $x=4$.• Solve the differential equation using the method of variation of constants: $y' - 2y/x = 2x^3$.• Find the general solution of the differential equation . using the method of variation of parameters.		
Work placement	Not applicable		