



Subject card

Subject name and code	Mathematics II, PG_00050159						
Field of study	Economics						
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 Adam Gnatek					
	Teachers	dr Adam Gnatek					
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						
WZiE - Ekonomia - Matematyka 2 2020/2021 (A.Gnatek) - Moodle ID: 13876 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13876							
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	10.0	55.0	125		
Subject objectives	The aim of this subject is to obtain the students competence in the range of using the basic methods of linear algebra and mathematical analysis. Furthermore, the student is able to use this knowledge to solve simple theoretical and practical problems that can be found in the fields of social sciences and engineering.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U02] can use theoretical knowledge in practice to solve basic micro and macroeconomic problems	Student uses basic notions and formulas of matrix calculus. Student solves systems of linear equations by various methods. Student effectively operates on complex numbers. Student verifies linear dependence of vectors. Student specifies eigenvalues and eigenvectors of a matrix. Student defines type of a quadratic form. Student applies the basic rules and techniques of integration to calculate indefinite integrals. Student analyses properties of a given function of two or three variables using differential calculus of several variables functions. Student studies convergence of number series. Student solves differential linear equations. Student determines local and global extremes of functions of several variables. The student uses the method of Lagrange multipliers to determine the constrained extrema.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
	[K6_W01] has a basic knowledge of economic and related sciences and their place in the whole system of social sciences and relations with other sciences	Student knows basic notions of linear algebra and examples. Student uses methods of linear algebra to solve economical tasks. Student analyses a given problem from analytic geometry. Students apply basic concepts and models of mathematical analysis. The student examines the functions and sketches their graphs. Student efficiently calculates integrals. Student uses definite integral to solve geometrical and economical tasks. Student uses mathematical analysis methods to examine the financial processes and solving economic issues. Student can use mathematical tables.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
Subject contents	LECTURES and TUTORIALS: Matrix algebra. Linear geometry of n-space, vectors, length and angle. Vector spaces, subspaces and spanning sets. Linear independence, basis and dimension. Eigenvalues and eigenvectors. Quadratic forms. LSM. Integral calculus of one variable functions - antiderivatives. Fundamental rules of integration, substitution method, integration by parts. Integration of rational, trigonometric and irrational functions. Riemann definite integral. Newton-Leibniz theorem. Fundamental methods of definite integration. Geometric and economic examples of applications. Improper integrals. Number and power series. Extrema of functions of two and several variables. Differential linear equations. Constrained extrema.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Oral exam	50.0%	20.0%
	Written exam	50.0%	20.0%
	Midterm colloquium	50.0%	60.0%
Recommended reading	Basic literature	1. Batóg B., Bieszk-Stolorz B., Foryś I., Guzowska M., Heberlein K., Matematyka dla kierunków ekonomicznych, Teoria, przykłady, zadania, Wydawnictwo Difin 2. OER - Open AGH e-books: Mathematics 3. Jankowska K., Jankowski T., Zbiór zadań z matematyki, PG Gdańsk	

	Supplementary literature	<p>Fragmentarily:</p> <ol style="list-style-type: none"> 1. Jankowska K., Jankowski T., Zadania z matematyki wyższej, PG Gdańsk 2. Banaś J., Podstawy matematyki dla ekonomistów, Wydawnictwa Naukowo-Techniczne, Warszawa 3. Jurlewicz T., Skoczylas Z., Algebra liniowa 1, 2, Definicje, twierdzenia wzory, Wydawnictwo GiS, Wrocław 4. Jurlewicz T., Skoczylas Z., Algebra i geometria analityczna, Definicje, twierdzenia wzory, Wydawnictwo GiS, Wrocław 5. Gewert M., Skoczylas Z., Analiza matematyczna 1, 2, Przykłady, zadania, Wydawnictwo GiS, Wrocław 6. Dymkowska J., Beger D., Rachunek całkowy w zadaniach, Wydawnictwo PG 7. OER Wrocław University: Mathematical Analysis, Video - lectures
	eResources addresses	<p>Podstawowe https://epodreczniki.open.agh.edu.pl/openagh-podreczniki.php?catelid=4 - OER - Open AGH e-books: Mathematics Uzupełniająca https://oze.pwr.edu.pl/kursy/analiza/analiza.html - OER Wrocław University: Mathematics, Video Lectures - Mathematical Analysis</p>

<p>Example issues/ example questions/ tasks being completed</p>	<p>Discuss the relation between the line l and the plane S.</p> <p>Check linear dependence of given system of vectors.</p> <p>Find eigenvalues and eigenvectors of symmetric matrix A.</p> <p>Solve the overdetermined system applying the least square method.</p> <p>Determine definiteness of quadratic form $Q(x)$.</p> <p>Evaluate the indefinite integral of the given rational function .</p> <p>Find the area between the two curves $y=$ and $y=$ from $x=$ to $x=$.</p> <p>Calculate definite integrals of the following functions using methods of integration by parts or by substitution.</p> <p>Identify any local extremes of function of two/three variables.</p> <p>Find the absolute extrema of the function $f(x,y)$ on the compact set D.</p> <p>Check whether the given series is convergent using the ratio test, the root test, the comparison test or the integral test.</p> <p>Determine radius and domain of convergence of a power series.</p> <p>Determine global extrema of functions of two / three variables on a convex set D.</p> <p>Solve the initial problem for linear differential equation of second order.</p>
<p>Work placement</p>	<p>Not applicable</p>