GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical Analysis, PG_00050156
Field of study	Economic Analytics

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	blended-learning
Year of study	1	Language of instruction	Polish
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 inż. Natalia Jarzębkowska
	Teachers	dr inż. Natalia Jarzębkowska

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: 30.0						
	Adresy na platformie eNauczanie: WZiE - AG - Analiza matematyczna 2021/2022 (N.Jarzębkowska) - Moodle ID: 22532 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22532						

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	12.0	78.0	150

Subject objectives	The aim of this subject is to obtain the students competence in the range of using the basic methods of mathematical analysis.Furthermore, the student is able to use this knowledge to solve simple theoretical and practical problems that can be found in finances, economic issues and in the fields of social sciences.

Learning outcomes		Course outcome	Subject outcome	Method of verification
		[K6_W02] Knows how to describe economic phenomena using quantitative methods with the use of IT tools.	Student names basic properties of elementary functions. Student defines the basic concepts of differential calculus of one variable function. Student defines the basic rules and techniques of integration to calculate indefinite integrals. Student defines the basic concepts of differential calculus of several variable function. Student defines the basic concepts of number series. 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.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
		[K6_U08] Has the ability to use mathematical and IT tools to analyse economic phenomena and make decisions by economic entities.	Students apply basic concepts and models of mathematical analysis Student solves equations and inequalities with elementary functions. Student solves exercises involving numerical sequences. Student evaluates the limits of functions. Student uses the first and second derivatives of a function to analyze its properties. Student applies the basic rules and techniques of integration to calculate indefinite integrals. Student uses definite integral to solve geometrical and economical problems. Student examines functions of several variables, using the concept of a limit, continuity and derivatives. Student determines convergence of number series. Student solves differential equations and difference linear equations.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools

Subject contents	LECTURES and TUTORIALS
	Functions of one variable and their properties. Elementary functions: absolute value, polynomials, rational, power, exponential, logarithmic, trigonometric, cyclometric - properties, graphs, solving equations and inequalities.
	Infinite sequences - properties, limits. The limit and continuity of a function. Derivatives and differentials of first and higher orders. Rolle, Lagrange, de l'Hospital, Taylor-Maclaurin theorems. Monotonicity and local extrema. Convexity, concavity and inflexion points of a function. Asymptotes.
	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 application. Improper integrals.
	Number and power series.
	Extrema of functions of two and several variables.
	Differenial and difference linear equations.
	Constrained extrema.

Prerequisites and co-requisites	Knowledge of the high school mathematics.

Assessment methods and criteria			
	Subject passing criteria	Passing threshold	Percentage of the final grade
	Class activity	50.0%	25.0%
	Midterm colloquium	50.0%	25.0%
	Final exam	50.0%	50.0%

Recommended reading	Basic literature	1. Wikieł B., Matematyka, Podstawy z elementami matematyki wyższej, Wydawnictwo PG, Gdańsk 2009
		2. Dymkowska J., Beger D., Rachunek różniczkowy w zadaniach, Wydawnictwo PG, 2016
		3. Dymkowska J., Beger D., Rachunek całkowy w zadaniach, Wydawnictwo PG, 2015
		4. Batóg B., Bieszk-Stolorz B., Foryś I., Guzowska M., Heberlein K., Matematyka dla kierunków ekonomicznych, Teoria, przykłady, zadania, Wydawnictwo Difin 2016
	Supplementary literature	1. Banaś J., Podstawy matematyki dla ekonomistów, Wydawnictwa Naukowo-Techniczne, Warszawa
		2. Gewert M., Skoczylas Z., Analiza matematyczna 1, Definicje, twierdzenia wzory, Wydawnictwo GiS, Wrocław
		3. Gewert M., Skoczylas Z., Analiza matematyczna 2, Definicje, twierdzenia wzory, Wydawnictwo GiS, Wrocław
		4. Jankowska K., Jankowski T., Zbiór zadań z matematyki, PG Gdańsk
	eResources addresses	WZiE - AG - Analiza matematyczna 2021/2022 (N.Jarzębkowska) - Moodle ID: 22532 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22532

Example issues/ example questions/ tasks being completed	Find the derivatives of the following functions .
	Find local extremes and intervals of monotonicity of the following function f(x)= .
	Sketch the graph of the function f(x). Identify any local extrema and points of inflection
	Evaluate the indefinite integral of the given rational function .
	Find the area between the two curves y= and y= from x= to x= .
	Calculate definite integrals of the following functions using methods of integration by parts or by substitution.
	Identify any local extremes of function of two/three variables.
	Find the absolute extrema of the function f(x,y) on the compact set D.
	Check whether the given series is convergent using the ratio test, the root test, the comparison test or the integral test.
	Determine radius and domain of convergence of a power series.
	Determine global extrema of functions of two / three variables on a convex set D.
	Solve the initial problem for linear differential equation of second order.

Work placement	Not applicable