GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	MATHEMATICS 2, PG_00061165		
Field of study	Management		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
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	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. Magdalena Łapińska	
	Teachers		

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						

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	11.0	54.0	125

Subject objectives

Uses the apparatus of linear algebra and mathematical analysis to solve theoretical and practical problems occurring in social sciences

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U04] formulates logical solutions to complex or unstructured problems	integrates the information obtained from solving complex problems, interpreting them, drawing conclusions and formulating and justifying opinions	[SU2] Assessment of ability to analyse information
[K6_W02] demonstrates comprehensive preparation in terms of methods, techniques for formulating and solving problems	uses a mathematical apparatus to solve economic problems, combining knowledge of mathematics with knowledge of social sciences	[SW1] Assessment of factual knowledge

Subject contents

Intervals of concavity, points of inflection
Analysis of functions and their graphs. Examples of application of functions and derivatives in economics. Demand functions, logistic function, marginal cost, revenue and profit function. Elasticity of demand, the basic principle of economics. Infinite series. Partial sums, convergence of a series, geometric series, harmonic series. Convergence tests, p-series
Integral calculus. Antiderivatives, indefinite integrals, the basic formulae. Integration by substitution. Integration by parts. Integration of rational functions. Definite integral. Properties of definite integrals. Integration by substitution and by parts in the case of definite integrals. Applications of definite integrals. Improper integrals
Multivariable differential calculus. Functions of two or more variables, limits and continuity. Partial derivatives, differentiability and chain rules. Maxima and minima of functions of two variables. Absolute extrema on closed and bounded sets. Gradient. Lagrange method of multipliers. Repeated and double integrals.
Probability, random variables Basic concepts in probability theory: definition of probability, axioms, joint probability, independence. Discrete random variable; probability density function. Continuous random variable, probability density function. Probability distribution function, expectations, variances and standard deviations
Basic distributions of random variables The binomial distribution. Poisson distribution. Normal distribution

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Final exam	50.0%	80.0%
Homework assignments	0.0%	20.0%

Recommended reading	Basic literature	Martin Anthony, Norman Biggs, Mathematics for Economics and Finance Methods and Modelling, Cambridge University Press ISBN: 0521559138 Ken Binmore and Joan Davies , CALCULUS: Concepts and methods, Cambridge University Press ISBN: 0521775418 T. Jankowski, Linear Algebra, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2001, ISBN 83-88007-87-4
	Supplementary literature	Hwei Hsu, Schaum's Outline of Probability, Random Variables, and Random Processes, Second Edition, McGraw-Hill; 2 edition ISBN: 978-0071632898
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	• 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 extremum 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. • Given the probability function of the random variable X: p(-5)=0.1, p(-2)=0.2, p(0)=0.1, p(1)=0.2, p(3)=c, p(8)=0.1 find: 1. the graph of the probability function 2. the distribution function and its graph (F(x)=P(X 3. probabilities P(X=1), P(X=2), P(X<3), P(X<2), P(X 0), P(-2 X < 1), 4. mean value 5. variance and standard deviation • Find: mean value, variance, the distribution function and P(X > 1) if the density function of the random variable X is of the form $f(x)= 3/4(2x-x_2)$ if 0 x 2 and f(x)=0 otherwise. • A consumer buys apples and bananas and has utility function $u(x_1,x_2)=x_1x_2^2$, where x_1 is the number of apples and x_2 the number of bananas. Suppose that he has \$1.80 to spend on the bundle of apples and bananas, and that apples cost \$0.12 each, bananas cost \$0.20 each. Write down the budget equations and the Lagrangean for the problem of finding the optimal bundle. What is the optimal bundle?	
Work placement	Not applicable	