GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical Analysis, PG_00021503		
Field of study	Mathematics		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	10.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Divison of Nonlinear Analysis -> Institute of Applied Mathematics -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Styborski	
	Teachers	mgr inż. Urszula Goławska dr inż. Marcin Styborski dr inż. Magdalena Chmara	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	60.0	60.0	0.0	0.0	0.0	120

E-learning hours included: 0.0

Adresy na platformie eNauczanie:

Analiza matematyczna III - 2024/2025 - Moodle ID: 41234 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=41234

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	120	5.0	125.0	250

Subject objectives

The aim of the course is to familiarize students with the basics (definitions, theorems, methods of calculation and problem-solving methods) of integral calculus of functions of several variables and its applications in field theory, physical and technical issues.

Learning outcomes	(see table below)

Course outcome	Subject outcome	Method of verification
K6_W07	The student is able to justify the importance of the Jacobian of a function of several variables and what role it plays in the theorem on the change of variables in a multiple integral.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
K6_W04	The student after the course will be familiar with classical theorems that generalize the Newton-Leibniz formula to higher dimensions, i.e. Green, Gauss and Stokes. He can apply these theorems.	[SW1] Assessment of factual knowledge
K6_U04	Student knows the definition and examples of curves and surfaces. Can calculate their lengths and areas respectively. Knows the concept of multidimensional volume.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
K6_U06	Student is able to define the integral of a function of several variables, is able to change the integral of such a function into an iterated integral and perform calculations in appropriately selected examples. Also defines the line and surface integral.	[SU3] Assessment of ability to use knowledge gained from the subject
K6_U02	The student is able to conduct formal reasoning leading to justification of Fubini, Green, and Stokes theorems.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information

Subject contents	The inverse function theorem, the implicit function theorem, and the method of Lagrange multipliers. Riemann integral in n-dimensional space. Fubini theorem and iterated integrals. Normal regions and their properties. Change of variables in multiple integrals . Curvilinear integrals. Green theorem and its applications. Surface integrals. Gauss - Ostrogradsky theorem. Stokes theorem. Elements of field theory: a divergence and rotation of a vector field. Gradient fields. Applications of curvilinear, multiple and surface integrals in physics and engineering. Introduction to the theory of Lebesgue measure and integration.
Prerequisites and co-requisites	Knowledge of previous courses of mathematical analysis (analysis I and analysis II: calculus of functions of several variables, integral calculus of functions of one variable)
Assessment methods and criteria	(see table below)

Subject passing criteria	Passing threshold	Percentage of the final grade
an exam	50.0%	36.0%
a completion of the exercises	50.0%	64.0%

Recommended reading		
	Basic literature	• W. Rudin, "*Principles of Mathematical Analysis,*" PWN, Warsaw 2009 • G. Fichtencholz, "*Differential and integral calculus",* PWN, Warsaw 1976.
	Supplementary literature	• M. Spivak, "*Calculus on manifolds*", PWN, Warsaw 1977 • P. Lax, M.S. Terrell, "Multivariable calculus with applications", Springer
	eResources addresses	Analiza matematyczna III - 2024/2025 - Moodle ID: 41234 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=41234

Example issues/ example questions/ tasks being completed	Calculate a double/ triple/ path/ surface integral. Apply the theorem of Green/ Gauss/ Stokes.
Work placement	Not applicable