

Subject card

Subject name and code	Mathematical Analysis for Physicists, PG_00208374						
Field of study	Physics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2026/2027		
Education level	Bachelor's 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		Polish		
Semester of study	2		ECTS credits		7.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Division of Mathematical Methods of Physics -> Institute of Theoretical Physics and Astrophysics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Marcin Marciniak				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	45.0	0.0	0.0	0.0	90
	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	90		0.0		85.0	175
Subject objectives	An introduction to mathematical analysis, one of the fundamental tools for developing the mathematical formalism of physical theories.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[FIZL3_U01] can use advanced mathematical formalism to define, describe, and solve problems in physics	The student is able to: calculate the limits of sequences and functions determine the derivatives of functions of one variable apply differential calculus to study the behavior of functions calculate integrals using integration by parts and substitution determine local extrema and conditional local extrema of functions of several variables calculate line integrals and surface integrals analyze the properties of vector fields	[SU3] text preparation/written work [SU5] implementation of a problem task
	[FIZL3_W04] knows, on the advanced level, the methods of higher mathematics, including differential and integral calculus of functions of one and many variables, and the basics of algebra to the extent necessary to describe physical phenomena and solve physical problems	The student knows: the concept of the limit of a numerical sequence, the concepts of the limit and continuity of a function of one real variable, the basic rules of differential calculus, the concept of a Taylor series, methods for integrating functions of one variable, applications of integral calculus, methods for finding extrema of functions of many variables, and the Lagrange multipliers method, elements of vector analysis, the concepts of gradient, curl, and divergence of a vector field, multiple integrals, line integrals, and surface integrals, the theorems of Gauss and Stokes.	[SW4] test/exam - oral or written

Subject contents	Elements of metric space theory. Convergence of sequences in metric spaces. Numerical series. Real-valued functions of one variable: • Limit and continuity. • Differential calculus. • Taylor series. • Integration of functions of one variable, indefinite and definite integrals. • Methods of integral computation. • Applications of integral calculus. Functions of several variables: • Differential calculus. • Function extrema. • The Lagrange multipliers method. Elements of vector analysis: • Gradient, curl, and divergence. Multiple integrals, line integrals, and surface integrals. The Gauss and Stokes theorems.		
Prerequisites and co-requisites	not applicable		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	51.0%	45.0%
	Test	51.0%	55.0%
Recommended reading	Basic literature		W. Rudin, Principles of mathematical analysis, McGraw-Hill, 2000 D. J. H. Garling, A Course in Mathematical Analysis, Cambridge University Press, 2013
	Supplementary literature		not applicable
	eResources addresses		
Example issues/ example questions/ tasks being completed	not applicable		
Work placement	Not applicable		