University of Gdańsk

Subject card

Subject name and code	Mathematical Analysis for Physicists, PG_00182295		
Field of study	Physics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
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 Classes may be conducted in English in the following cases: - when the course is taught by an English-speaking instructor, - when a non-Polish-speaking international student is present in the group, - when the course is delivered by an invited external expert, - at the request of the students in the group.
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	90.0	180

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 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

<table>
<tr><td>Subject contents</td><td>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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>not applicable</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Exam</td><td>51.0%</td><td>45.0%</td></tr>
<tr><td>Test</td><td>51.0%</td><td>55.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>W. Rudin, Principles of mathematical analysis, McGraw-Hill, 2000

D. J. H. Garling, A Course in Mathematical Analysis, Cambridge University Press, 2013</td></tr>
<tr><td>Supplementary literature</td><td>not applicable</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>not applicable</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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