University of Gdańsk

Subject card

Subject name and code	Analytic Functions I, PG_00204258		
Field of study	Mathematics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2028/2029
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Optional subject group 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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit	Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Iwona Krzyżanowska	
	Teachers		

Lesson types	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	3.0	62.0	125

Subject objectives	
	Introduction of basic concepts regarding the complex plane and the analysis of complex functions of onevariable. Proving the most important theorems regarding analytical functions. Applications.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MATL3_W02] knows and understands at an advanced level selected concepts, methods and theorems of mathematical analysis, differential equations and measure theory, as well as basic examples both illustrating specific concepts in this field and allowing to refute false hypotheses or invalid reasoning	The student knows and understands the basic definitions and theorems within the curriculum. The student is familiar with examples illustrating specific concepts covered by the curriculum.	[SW4] test/exam - oral or written [SW5] implementation of a problem task
[MATL3_U06] can formulate definitions and theorems in an understandable manner, both orally and in writing, and present correct mathematical reasoning on the learned topics	The student is able to independently solve problems and exercises based on the theory presented in lectures and can formulate definitions and theorems related to the theory of complex analytic functions.	[SU4] test/exam - oral or written [SU5] implementation of a problem task
[MATL3_U02] is able to correctly use the concepts of mathematical analysis, differential equations and measure theory, is able to apply the theorems and methods of these fields and is able to interpret the obtained results	The student can prove the most important theorems related to the theory of complex analytic functions and, using the learned theory, examine the properties of analytic functions, as well as the series, integrals, and points associated with them.	[SU4] test/exam - oral or written [SU5] implementation of a problem task
[MATL3_W07] knows and understands at an advanced level the role and importance of proof in mathematics, as well as the concept of the importance of assumptions	The student understands the importance of the assumptions in stated theorems and knows counterexamples demonstrating their significance.	[SW4] test/exam - oral or written [SW5] implementation of a problem task

Subject contents

Reminder of the basic algebraic and topological properties of the set of complex numbers.Power series and their convergence.Complex functions of a real variable, exponential functions, trigonometric functions, Euler's formula.Complex logarithm and power of a complex number.Differentiable functions, derivatives and their basic properties.Holomorphic function. Cauchy-Riemann equations, sufficient and necessary conditions fordifferentiability.Linear integral of a complex function, basic properties.Cauchy's theorem and theorem about the existence of a primary function.Cauchy's integral formula.Holomorphic function as a power series, Morera's theorem.Zeros of the holomorphic function.The principle of maximum.Liouville's theorem. Laurent series, expansion of the holomorphic function into the Laurent series.Isolated singular points.Residuum of functions, residual theorem and its application to computing improper integrals of realfunctions.Function sequences of holomorphic functions.

Prerequisites and co-requisites

None.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
tests	51.0%	45.0%
exam	51.0%	55.0%
Observation of the student's attitude	51.0%	0.0%

Recommended reading

Basic literature

1. F. Leja, Teoria funkcji analitycznych, PWN

2. J. Długosz, Funkcje zespolone. Teoria, przykłady, zadania

	Supplementary literature	1. W. Rudin, Analiza rzeczywista i zespolona 2. J. Krzyż, Zbiór zadań z funkcji analitycznych 3. J. Chądzyński, Wstęp do analizy zespolonej w zadaniach
	eResources addresses	
Example issues/ example questions/ tasks being completed	none	
Work placement	Not applicable	

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