

Subject card

Subject name and code	Analytic functions I, PG_00155443						
Field of study	Mathematics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2027/2028		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
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		6.0		
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		10.0		80.0	150
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_K06] is ready to formulate opinions on basic mathematical issues	The student is ready to formulating opinions on the topic basic issues mathematics in the field of program content.	[SK5] implementation of a problem task [SK8] observation of student's independent or team work
	[MATL3_W02] knows and understands the basic concepts, methods and theorems of mathematical analysis as well as basic examples illustrating specific concepts in this field and enabling the refutation erroneous hypotheses or unauthorized reasoning	The student knows and understands basic definitions, theorems in the field of program content.	[SW4] test/exam - oral or written [SW5] implementation of a problem task
	[MATL3_W09] knows and understands the role and importance of proof in mathematics, as well as the concept of the importance of assumptions	The student understands the importance of assumptions formulated statements. Knows counterexamples showing their importance.	[SW4] test/exam - oral or written [SW5] implementation of a problem task
	[MATL3_U08] is able to formulate definitions and theorems in an understandable way, both orally and in writing, and present correct mathematical reasoning regarding the acquired issues	The student can prove most important statements regarding the theory of analitical functions.	[SU4] test/exam - oral or written
	[MATL3_U09] is able to plan how to solve a specific problem and prepare a correct record of this solution, providing strict and precise justification for the correctness of his reasoning	The student can do it independently solve problems and tasks in based on the theory presented at lecture.	[SU4] test/exam - oral or written [SU5] implementation of a problem task
	[MATL3_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; is willing to act ethically	The student is ready to understand and appreciate the importance of honesty intellectual in activities your own and other people's; ethical conduct.	[SK4] test/exam - oral or written [SK8] observation of student's independent or team work
	[MATL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning	The student is ready to precise formulation of questions, serving to deepen your own understanding of a given topic or finding the missing ones elements of reasoning in the context of the curriculum content of this subject..	[SK8] observation of student's independent or team work
	[MATL3_W08] knows and understands the structure of mathematical theories, is able to use mathematical formalism to build and analyze simple mathematical models in other fields of science	The student knows and understands theorems with proofs in the field of program content.	[SW4] test/exam - oral or written [SW5] implementation of a problem task
	[MATL3_K09] is ready to critically evaluate arguments, find gaps in reasoning and constructively criticize other people's reasoning	The student is ready to critically assessing arguments, finding gaps in reasoning and constructively criticizing other people's reasoning in the scope of the subject content.	[SK8] observation of student's independent or team work
	[MATL3_U02] is able to correctly use the known concepts of mathematical analysis, is able - at a simple and medium level of difficulty - to apply the known theorems and methods of this field and is able to interpret the obtained results	The student knows how to use theory learned during the lecture, examine the properties of functions analytical and series, integrals and associated points with these functions.	[SU4] test/exam - oral or written [SU5] implementation of a problem task
	[MATL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education	The student is ready for recognition limitations of one's own knowledge and it is ready for further education in topics related to the content of the subject.	[SK8] observation of student's independent or team work

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
	exam	51.0%	55.0%
	tests	51.0%	45.0%
	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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