

Subject card

Subject name and code	Mathematical methods of physics - classes, PG_00155334						
Field of study	Physics						
Date of commencement of studies	October 2024		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	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		2.0		
Learning profile	academic		Assessment form		credit		
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 Krzysztof Szczygielski				
	Teachers		dr Krzysztof Szczygielski				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	30.0	0.0	0.0	0.0	30
	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	30		0.0		30.0	60
Subject objectives	Acquiring the ability to operate with concepts and facts presented in the lecture Mathematical Methods of Physics I by solving selected computational problems.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[FIZL3_U02] has the ability to perform measurements of basic physical quantities; can develop, describe and present the results of simple physical experiments and computer simulations; can perform quantitative analyses and formulate qualitative conclusions on this basis; can estimate measurement uncertainties	The student is able to: study the convergence of complex sequences and the continuity of functions in the complex domain, investigate if a complex function is holomorphic by definition and using Cauchy-Riemann equations, calculate derivatives and contour integrals of complex functions, expand them into a power series and determine its radius of convergence, investigate the type of singularity and expand a meromorphic function into a Laurent series, calculate residues, apply the residue theorem to calculate improper integrals of the real functions, determine the expansion coefficients in the Fourier series of real function and determine its convergence.	[SU3] text preparation/written work
	[FIZL3_W02] understands the role of physical experiments, mathematical theoretical models approximating reality and computer simulations in the methodology of scientific research; is aware of technological, equipment and methodological limitations in scientific research	Student knows: the basic topological properties of the complex plane, the concept of a holomorphic function, the concept of the contour integral of a complex function, the equivalent conditions of being holomorphic, analyticity, the concept of the Laurent series, the residue theorem and its application to the calculation of improper integrals of real functions, the concept of the trigonometric series and the Fourier series of a real function, the formulas for coefficients in the Fourier series, the Bessel's inequality and the Parseval's identity, the theorems of convergence of the Fourier series, the definition and properties of the Fourier transformation.	[SW3] text preparation/written work
	[FIZL3_U16] can independently plan and implement his own learning	The student is able to: study the convergence of complex sequences and the continuity of functions in the complex domain, investigate if a complex function is holomorphic by definition and using Cauchy-Riemann equations, calculate derivatives and contour integrals of complex functions, expand them into a power series and determine its radius of convergence, investigate the type of singularity and expand a meromorphic function into a Laurent series, calculate residues, apply the residue theorem to calculate improper integrals of the real functions, determine the expansion coefficients in the Fourier series of real function and determine its convergence.	[SU3] text preparation/written work
	[FIZL3_K02] can precisely formulate problems to deepen understanding of a given topic	The student knows/is aware that theorems and methods of inference developed by mathematics have a direct impact on the way of understanding physical phenomena occurring in the surrounding world, and knows the importance of complex analysis and harmonic analysis in various aspects of effective modeling of natural reality.	[SK3] text preparation/written work

	Course outcome	Subject outcome	Method of verification
	[FIZL3_W04] knows the basic techniques 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	Student knows: the basic topological properties of the complex plane, the concept of a holomorphic function, the concept of the contour integral of a complex function, the equivalent conditions of being holomorphic, analyticity, the concept of the Laurent series, the residue theorem and its application to the calculation of improper integrals of real functions, the concept of the trigonometric series and the Fourier series of a real function, the formulas for coefficients in the Fourier series, the Bessel's inequality and the Parseval's identity, the theorems of convergence of the Fourier series, the definition and properties of the Fourier transformation.	[SW3] text preparation/written work
	[FIZL3_K08] is able to speak competently on basic problems of physics and its applications	The student knows/is aware that theorems and methods of inference developed by mathematics have a direct impact on the way of understanding physical phenomena occurring in the surrounding world, and knows the importance of complex analysis and harmonic analysis in various aspects of effective modeling of natural reality.	[SK3] text preparation/written work
	[FIZL3_U08] can use mathematical apparatus and numerical methods to describe and model physical phenomena and processes	The student is able to: study the convergence of complex sequences and the continuity of functions in the complex domain, investigate if a complex function is holomorphic by definition and using Cauchy-Riemann equations, calculate derivatives and contour integrals of complex functions, expand them into a power series and determine its radius of convergence, investigate the type of singularity and expand a meromorphic function into a Laurent series, calculate residues, apply the residue theorem to calculate improper integrals of the real functions, determine the expansion coefficients in the Fourier series of real function and determine its convergence.	[SU3] text preparation/written work
	[FIZL3_K01] knows the limitations of his own knowledge and understands the need for further education	The student knows/is aware that theorems and methods of inference developed by mathematics have a direct impact on the way of understanding physical phenomena occurring in the surrounding world, and knows the importance of complex analysis and harmonic analysis in various aspects of effective modeling of natural reality.	[SK3] text preparation/written work

