



Subject card

Subject name and code	Mathematical Analysis I, PG_00052404						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study 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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			6.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Mathematics Center -> Vice-Rector For Education						
Name and surname of lecturer (lecturers)	Subject supervisor	dr Magdalena Musielak					
	Teachers	dr Magdalena Musielak mgr Anetta Brękiewicz-Sieg mgr Jolanta Fidytek mgr Małgorzata Suchecka					
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	6.0		84.0	150	
Subject objectives	Students obtain competence in the range of using methods of mathematical analysis and knowledge how to solve simple problems that can be found in the field of engineering.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn	Student applies the basic rules and techniques of integration to calculate indefinite and definite integrals. Student uses definite integrals to solve geometrical tasks. Student analyses properties of a given function of two variables using differential calculus of several variables functions. Student calculates double and triple integrals and uses them in geometrical problems. Student applies the basic rules and techniques of integration to calculate indefinite and definite integrals. Student uses definite integrals to solve geometrical tasks. Student analyses properties of a given function of two variables using differential calculus of several variables functions. Student calculates double and triple integrals and uses them in geometrical problems. Student uses Laplace transform.	[SU4] Assessment of ability to use methods and tools
	[K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	Student defines basic notions of differential calculus of several variables function and integral calculus of one and several variables functions. Student defines basic notions of differential calculus of several variables function and integral calculus of one and several variables functions.	[SW1] Assessment of factual knowledge
Subject contents	<p>Course content – lecture Indefinite integrals, properties. Integration methods. Integration by parts and by substitution. Integration of rational functions. Integration of trigonometric functions. Integration of irrational functions. Methods for calculating definite integrals. Applications of definite integrals. Improper integrals. Applications of improper integrals. Functions of several variables. Definition, examples. Limit of a function of several variables. Partial derivatives. Extrema of a function of two variables. Double integral over a rectangle and a normal area. Change of variables in a double integral. Applications of double integrals. Triple integral over a cuboid and a normal area. Change of variables in triple integrals. Applications of triple integrals. Complex function of a complex variable. Differentiability of complex functions. Cauchy-Riemann conditions. Integration of complex functions. Laplace transform.</p> <p>Course content – exercises Calculation of definite, indefinite and improper integrals. Applications of integrals to calculate areas, volumes of solids of revolution, surface areas of solids and arc lengths. Analysis of functions of several variables, calculation of partial derivatives. Calculation of extrema of functions of two variables. Calculation of double and triple integrals. Geometric applications of integrals. Calculation of derivatives and some integrals of complex functions. Laplace transform.</p>		
Prerequisites and co-requisites	Knowledge of "Elementary Mathematics"		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final exam	40.0%	60.0%
	Tests	0.0%	40.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> Gewert M., Skoczylas Z., Analiza matematyczna 1, Oficyna Wydawnicza GiS. Gewert M., Skoczylas Z., Analiza matematyczna 2, Oficyna Wydawnicza GiS. J.Dymkowska, D.Beger, Rachunek różniczkowy w zadaniach, Wydawnictwo PG. J.Dymkowska, D.Beger - Rachunek całkowy w zadaniach, Wydawnictwo PG. Długosz J., Funkcje zespolone. Teoria, przykłady, zadania, Oficyna Wydawnicza GiS. 	
	Supplementary literature	<ol style="list-style-type: none"> Decewicz G., Żakowski W., "Podręczniki Akademickie - Matematyka. Część I", Wydawnictwo Naukowo-Techniczne. Fichtenholz G.M., "Rachunek różniczkowy i całkowy", tom 1, Wydawnictwo Naukowe PWN. Jankowska K., Jankowski T., "Funkcje wielu zmiennych, całki wielokrotne, geometria analityczna", Wydawnictwo Politechniki Gdańskiej. 	

	eResources addresses	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Find the area of the surface obtained by the rotation of the arc $y = e^{-x}$ around the OX-axis for x from $x_1 = 0$ to $x_2 = \ln 2$. 2. Compute partial differentials of the second order for the given function $f(x,y) = x^3 \operatorname{arctg}(xy^2)$. 3. Find extreme values of the function $f(x,y) = e^{2y}(x^2 - y^2)$. 4. Compute the double integral of the given function $f(x,y) = \ln(1 + x^2 + y^2)$ over the region $D: x^2 + y^2 \leq R^2, x \geq 0, y \geq 0$. 5. Using cylindrical or spherical coordinates evaluate the triple integral for the function $f(x,y,z) = z(x^2 + y^2)^{1/2}$ over the region $V: x = 0, x = y, x^2 + y^2 = 9, x^2 + y^2 = 4, z = 0, z = 1$. 	
Practical activities within the subject	Not applicable	

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