



## Subject card

Subject name and code	Mathematics, PG_00064173						
Field of study	Transport						
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		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			6.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Mathematics Center -> Vice-Rector For Education						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Krzysztof Radziszewski				
	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		15.0		75.0	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_U08] able to carry out simple engineering tasks related to the construction and operation of a selected element of the transport system, select the right methods and tools	Student:uses definite integral to solve geometrical tasks, analyses a tasks from analytical geometry, uses the basic operations on complex numbers, examines functions of several variables, using the concept of limit, continuity and derivatives, calculates double integrals, and explains the substitution method, applies double integrals to solve geometrical problems, demonstrates some techniques for solving ordinary differential equations. Student recognizes the importance of self-expanding knowledge and take the challenge of working with a group to solve a problem.	[SU3] Assessment of ability to use knowledge gained from the subject
	[K6_W01] has knowledge of mathematical analysis, algebra, calculus of probability and operational research required for describing and solving transport problems	Student:uses definite integral to solve geometrical tasks, analyses a tasks from analytical geometry, uses the basic operations on complex numbers, examines functions of several variables, using the concept of limit, continuity and derivatives, calculates double integrals, and explains the substitution method, applies double integrals to solve geometrical problems, demonstrates some techniques for solving ordinary differential equations. Student recognizes the importance of self-expanding knowledge and take the challenge of working with a group to solve a problem.	[SW1] Assessment of factual knowledge
Subject contents	Course content – lecture Integrals of rational functions. Definite Riemann integral. Improper integrals. Applications of integral calculus. Analytic geometry: basic vectors definitions and properties, dot product, cross product, their properties and its applications, the triple scalar product and applications, equations of lines and planes in 3-space, the distance from a point to a plan, angles between planes and lines. Complex numbers: algebraic, trigonometric, exponential form, operations, exponentiation (Moivre formula), finding roots of complex numbers. Functions of several variables. Partial derivatives. Total differential. Maxima and minima of a function of several variables. Ordinary differential equations: separable diff. eq., linear first-order diff. eq., Bernoullis eq., linear diff. eq. with constant coefficients of higher order. Double integrals. Applications of double integrals.		
Prerequisites and co-requisites	There is no requirement.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	50.0%	100.0%
Recommended reading	Basic literature	1. K. Jankowska, T. Jankowski, Funkcje wielu zmiennych. Całki wielokrotne. Geometria analityczna, PG, Gdańsk 2005. 2. K. Jankowska, T. Jankowski, Zadania z matematyki wyższej, PG, Gdańsk 1999. 3. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 i 2 Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2003. 4. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 i 2 Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2003. 5. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne , Oficyna Wydawnicza GiS, Wrocław 2001.	
	Supplementary literature	6. R. Leitner, Zarys matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 2001. 7. R. Leitner, W. Matuszewski, Z. Rojek, Zadania z matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 1999. 8. W. Kryszicki, L. Włodarski, Analiza matematyczna w zadaniach I i II, Wydawnictwo Naukowe PWN, Warszawa 1998.	
	eResources addresses		

Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Sketch the graph of the function <math>f(x,y)=(9-x^2-y^2)^{1/2}</math>.</li> <li>2. Identify any local extrema of the function <math>f(x,y)=e^{x-y}(x^2-2y^2)</math>.</li> <li>3. Find the absolute extrema of the function <math>f(x,y)=xy-x(x+1)-y(y+1)</math> on the set <math>D=\{(x,y): x^2+y^2 \leq 25, y \geq 3\}</math>.</li> <li>4. Solve the equation <math>y''+6y'+9y=10\sin x</math>.</li> <li>5. Find the area between the two curves <math>y^2=4+x</math> and <math>x+3y=0</math>.</li> <li>6. Find the distance between lines <math>l: (x-9)/4 = (y+2)/(-3) = z</math> and <math>k: x/(-2) = (y+7)/9 = (z-2)/2</math>.</li> </ol>
Practical activities within the subject	Not applicable

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