



Subject card

Subject name and code	Mathematical Analysis II, PG_00047364						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
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			blended-learning		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			5.0		
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 Barbara Wiekieł					
	Teachers	mgr Anetta Brękiewicz-Sieg dr Robert Fidytek mgr inż. Wojciech Dąbrowski dr Barbara Wiekieł					
Lesson types and methods of instruction	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: 2.0						
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	5.0		60.0		125
Subject objectives	Students obtain competence in the range of using methods of full range 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_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 some elements of field theory, line and surface integrals, infinite, function and trigonometric Fourier series, differential and partial differential equations.			[SW1] Assessment of factual knowledge		
	[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 computes some basic elements of field theory. Student calculates line and surface integrals. Student studies convergence of infinite and function series. Student determines general and particular solutions of some types of the first order differential equations and nth order linear differential equations with constant coefficients.			[SU4] Assessment of ability to use methods and tools		
Subject contents	Line integrals of scalar field. Line integrals of vector field. Path independence. Greens Theorem. Surface integrals of scalar fields. Surface integrals of vector fields. Stokes Theorem. GaussOstrogradsky Theorem. Applications of line and surface integrals. Some elements of field theory. Orthogonal coordinate systems. Vector and integro-differential operations in orthogonal coordinate systems. Operational calculus. Differential operators: gradient, divergence, rotation, Laplacian. Vector and scalar fields. First order differential equations. Variables separable, linear, Bernoulli, exact differential equations. Higher order linear differential equations with constant coefficients. Infinite series. Convergence tests. Alternating series test. Absolute and conditional convergence. Function and power series. Radius and interval of convergence of a power series. Taylor and Maclaurin series. Trigonometric Fourier series.						

Prerequisites and co-requisites	Knowledge of subject: "Basic Mathematics". Knowledge of subject: "Calculus". Knowledge of subject: "Linear Algebra".														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="451 309 794 344">Subject passing criteria</th> <th data-bbox="794 309 1137 344">Passing threshold</th> <th data-bbox="1137 309 1477 344">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 344 794 378">Final colloquium</td> <td data-bbox="794 344 1137 378">50.0%</td> <td data-bbox="1137 344 1477 378">60.0%</td> </tr> <tr> <td data-bbox="451 378 794 412">Activity</td> <td data-bbox="794 378 1137 412">0.0%</td> <td data-bbox="1137 378 1477 412">10.0%</td> </tr> <tr> <td data-bbox="451 412 794 445">Tests</td> <td data-bbox="794 412 1137 445">50.0%</td> <td data-bbox="1137 412 1477 445">30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Final colloquium	50.0%	60.0%	Activity	0.0%	10.0%	Tests	50.0%	30.0%
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Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> Find the gradient of the scalar field $F(x,y,z) = x e^{yz}$. Check if the vector field $W = [2xy+z^2, x^2, 2xz + \cos z]$ is potential. Check whether the given series with general term $a_n = (n! 3^n) / (n^n)$ is convergent. Find a particular solution of the differential equation $(x+1)y' + y = \ln x$ satisfying the initial condition $y(1)=10$. Applying Laplace transform find a solution of the differential equation $y'' + 2y' = 2e^{-2x}$ satisfying the given initial conditions $y(0) = 0$ i $y'(0) = 1$. 														
Work placement	Not applicable														