GDAŃSK UNIVERSITY OF TECHNOLOGY

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 2023	Academic year of realisation of subject	2023/2024
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 Wikieł	
	Teachers	dr Robert Fidytek dr Barbara Wikieł mgr Anetta Brękiewicz-Sieg mgr inż. Wojciech Dąbrowski	

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_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 canvergence 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
[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

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

Subject passing criteria	Passing threshold	Percentage of the final grade
Tests	50.0%	30.0%
Activity	0.0%	10.0%
Final colloquium	50.0%	60.0%

Recommended reading

Basic literature	1. Gewert M., Skoczylas Z., "Analiza matematyczna 2. Definicje, twierdzenia, wzory", Oficyna Wydawnicza GiS 2. Gewert M., Skoczylas Z., "Analiza matematyczna 2. Przykłady i zadania", Oficyna Wydawnicza GiS 3. Gewert M., Skoczylas Z., "Analiza matematyczna 2. Kolokwia i egzaminy", Oficyna Wydawnicza GiS 4. Gewert M., Skoczylas Z., "Elementy analizy wektorowej. Teoria, przykłady, zadania", Oficyna Wydawnicza GiS 5. Gewert M., Skoczylas Z., "Równania różniczkowe zwyczajne. Teoria, przykłady, zadania", Oficyna Wydawnicza GiS 6. Jankowska K., Jankowski T., "Zadania z matematyki wyższej", Wydawnictwo Politechniki Gdańskiej
Supplementary literature	1. McQuarrie D., "Matematyka dla przyrodników i inżynierów", tomy 1-3, Wydawnictwo Naukowe PWN 2. Stankiewicz W., Wojtowicz J., "Zadania z matematyki dla wyższych uczelni technicznych", Wydawnictwo Naukowe PWN
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

1. Find the gradient of the scalar field $F(x,y,z) = x\,e^{yz}$.

2. Check if the vector field $W = [\ 2xy+z^2\ ,x^2\ ,\ 2xz + \cos z\ ]$ is potential.

3. Check whether the given series with general term $a_n = (n!\ 3^n\ ) / (n^n\ )$ is convergent.

4. Find a particular solution of the differential equation $(x+1)\ y' + y = \ln x$ satisfying the initial condition $y(1)=10$.

5. Applying Laplace transform find a solution of the differential equation $y'' + 2\ y' = 2\ e^{-2x}$ satisfying the given initial conditions $y(0) = 0$ i $y'(0) = 1$.

Work placement

Not applicable