GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical Analysis, PG_00047542		
Field of study	Informatics		
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	mgr inż. Dorota Żarek mgr inż. Wojciech Dąbrowski mgr Anetta Brękiewicz-Sieg dr Magdalena Musielak	

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 defines basic notions of differential calculus of function with one variable. Student examines functions of one variable, using the concept of a limit, continuity and derivatives. Student uses basic rules and technics of integration to calculate indefinite integrals. Student names some geometric applications of definite integral. Student examines convergence of number series. Student uses power series to approximate calculations. Student determines general and particular solutions of some types of the first and second order differential equations. Uses second order linear differential equations to analysis of linear oscillation. Student uses the packets of software for symbolic and numeric calculations and interprets the results of these calculations .	[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 and uses the basic methods of mathematical analysis and differential equations to formulate and solve simple problems in the field of physics and informatics	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture

Derivative of a single variable function. Basic formulas for derivatives. Higher order derivatives. Taylor and Maclaurin's theorem. L'Hospital's rule. Asymptotes of a graph of a function. Extrema, concavity, convexity, inflection points. Information about partial derivatives. Extrema of a function of two variables. Indefinite integral. Basic formulas and methods of integration. Integration of elementary functions. Riemann integral. Fundamental theorem of calculus. Geometric applications of the definite integral. Numerical series. Convergent and divergent series. Criteria for convergence of numerical series. Power series. Radius and interval of convergence. Taylor and Maclaurin series. Integration and differentiation of power series. Examples of applications - approximate calculation of integrals. Information about Fourier series. First-order differential equations. General and particular solutions. Cauchy's initial value problem. Separable equations and first-order linear differential equations. Second-order linear differential equations with constant coefficients. Fundamental system of solutions of a homogeneous linear equation. Second-order linear differential equations with constant coefficients. Fundamental system of solutions to a homogeneous linear equation. Non-homogeneous linear differential equations. Method of undetermined coefficients and variation of parameters. Examples of applications - harmonic oscillator.

Course content – exercises

Calculating derivatives of single-variable functions. Applications of derivatives to calculate limits, examine monotonicity and convexity of functions, find extrema and inflection points, and approximate values of expressions. Calculating definite, indefinite and improper integrals. Applications of definite integrals to calculate areas, volumes of solids of revolution and arc lengths. Testing the convergence of numerical series. Determining the intervals of convergence of power series. Calculating the sums of power series using Taylor and McLaurin series and integrating and differentiating series. Solving first-order differential equations - separable and linear - and second-order linear equations.

Prerequisites and co-requisites

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Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterms	0.0%	40.0%
Final exam	40.0%	60.0%

Recommended reading

Basic literature	1. M. Gewert, Z. Skoczylas - Analiza Matematyczna 1, Oficyna Wydawnicza GIS 2007. 2. M. Gewert, Z. Skoczylas - Analiza Matematyczna 2, Oficyna Wydawnicza GIS 2007. 3. J. Dymkowska, D. Beger - Rachunek różniczkowy w zadaniach, Wydawnictwo PG 2016. 4. J. Dymkowska, D. Beger - Rachunek całkowy w zadaniach, Wydawnictwo PG 2017.
Supplementary literature	1. Decewicz G., Żakowski W., "Podręczniki Akademickie - Matematyka. Część I", Wydawnictwo Na-ukowo-Techniczne. 2. Fichtenholz G.M., "Rachunek różniczkowy i całkowy", tom 1, Wydawnictwo Naukowe PWN. 3. McQuarrie D., "Matematyka dla przyrodników i inżynierów", tomy 1-3, Wydawnictwo Naukowe PWN.
eResources addresses	

Example issues/ example questions/ tasks being completed	1. Find local extremes and intervals of monotonicity of the following function f(x)=(ln2x)/x. 2. Find the area between the curve y=x ln(x) and the OX axis from x=e to x=e. 3. Find the volume of a solid of revolution obtained by the rotation of the graph of the function f(x)=1 /(x2+2x+5) around the OX-axis. Sketch drawing. 4. Check wether the given series with general term an=(2nn!)/nn is convergent. 5. Using the theorems of differentiation or integration of the functional series find the sum of the power series Σ xn / (n+1) and next find the sum of the number series Σ 1/((n+1)2n). 6. Find the solution of the Cauchy problem : y'-y / x=x sin(2x); y(π/2)=π/4. 7. Find the general solution of the equation y''+2y'+y=e-2x.
Practical activites within the subject	Not applicable

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