GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical Analysis, PG_00047542		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
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 Barbara Wikieł	
	Teachers	dr Barbara Wikieł dr Robert Fidytek mgr Anetta Brękiewicz-Sieg	

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: 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_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
	[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 analisies properties of a given function of two variables using differentional 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 analisies properties of a given function of two variables using differentional calculus of several variables functions. Student calculates double and triple integrals and uses them in geometrical problems. Student studies complex functions. Student uses Laplace transform.	[SU4] Assessment of ability to use methods and tools
Subject contents	Indefinite integrals and their properties Integration formulas. The integration-by-parts formula. The substitution method of integration. Integration of rational functions. Integration of trigonometric functions. Integration of irrational functions. Methods of evaluations of definite integrals. Applications of definite integrals. Improper integrals. Applications of improper integrals. Functions of several variables. Definitions, examples. Limits of several variables functions. Partial derivatives. Extreme values of several variables functions. Double integrals over rectangles and normal domains. Two dimensional change of variables theorem. Applications of double integrals. Triple integrals over cuboids and normal domains. Three dimensional change of variables theorem. Applications of triple integrals. Complex functions. Derivatives and the Cauchy-Riemann equations. Complex integrals. Laplace transform.		
Prerequisites and co-requisites	Knowledge of "Basic mathematics"		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final exam	50.0%	60.0%
	Colloquium	50.0%	30.0%
	Activity	0.0%	10.0%

Recommended reading	Basic literature	1. Gewert M., Skoczylas Z., "Analiza matematyczna 1. Definicje, twierdzenia, wzory", Oficyna Wydaw-nicza GiS 2. Gewert M., Skoczylas Z., "Analiza matematyczna 1. Przykłady i zadania", Oficyna Wydawnicza GiS 3. Gewert M., Skoczylas Z., "Analiza matematyczna 1. Kolokwia i egzaminy", Oficyna Wydawnicza GiS 4. Gewert M., Skoczylas Z., "Analiza matematyczna 2. Definicje, twierdzenia, wzory", Oficyna Wydawnicza GiS 5. Gewert M., Skoczylas Z., "Analiza matematyczna 2. Przykłady i zadania", Oficyna Wydawnicza GiS 6. Gewert M., Skoczylas Z., "Analiza matematyczna 2. Kolokwia i egzaminy", Oficyna Wydawnicza GiS 7. Jankowska K., Jankowski T., "Funkcje wielu zmiennych, całki wielokrotne, geometria analityczna", Wydawnictwo Politechniki Gdańskiej
	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	Adresy na platformie eNauczanie: WETI - ACiR, IBM sem. 1 - Matematyka 2022/2023 (B.Wikieł) - Moodle ID: 22018 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22018
Example issues/ example questions/ tasks being completed	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: $x^2 + y^2 R^2$, x 0, y 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: $x = 0$, $x = y$, $x^2 + y^2 = 9$, $x^2 + y^2 = 4$, $z = 0$, $z = 1$. 6. Find the Laplace transform for the given function *f(t)=1/2(sin t -t cos t).*	
Work placement	Not applicable	