GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Applied Mathematics, PG_00049642
Field of study	Space and Satellite Technologies

Date of commencement of studies	February 2024	Academic year of realisation of subject	2023/2024
Education level	second-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	1	ECTS credits	3.0
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	dr Magdalena Musielak

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	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	30	10.0	35.0	75

Subject objectives	Student uses methods of mathematical analysis, differential and integral equations, numerical methods and computational software to solve problems appearing in the area of space and satellite technologies.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_W01] has extended knowledge of selected areas of mathematics making it possible to solve computational problems and develop research results of technical tasks.	Student defines the holomorphic function, evaluates line integrals of complex functions, is able to solve and analyze ordinary differential equations with the use of computational software, evaluates and applies Laplace, Fourier and other transforms, knows the basic types of integral equations, understands the concept of linear and nonlinear transformation as well as inverse problems, is able to solve and analyze them with the use of computational software.	[SW1] Assessment of factual knowledge
	[K7_K01] is aware of the constant necessity of improving and broadening their knowledge; can inspire and organise the teaching and learning process.	Student understands the need of lifelong learning. Student is able to inspire others and organize their learning process.	[SK5] Assessment of ability to solve problems that arise in practice
	K7_U06	Student is able to use their mathematical knowledge in combination with computational software to solve problems from the area of space and satellite technologies.	[SU4] Assessment of ability to use methods and tools

Subject contents	1) Complex analysis; complex functions of a real and complex variable; analytic functions; derivatives and line integrals of complex function
	2) Ordinary differential equations: numerical methods of solution in Matlab
	3) Transforms: Laplace, Z, Fourier, Hilbert; applications; evaluation with the use of Matlab
	4) Intro to integral equations
	5) Linear and nonlinear transformations of multidimensional space. Inverse problems: solving and analyzing with the use of Matlab
	6) Probability and statistics in engineering applications

Prerequisites and co-requisites	Knowledge of mathematical analysis and linear algebra on undergraduate level

Assessment methods and criteria			
	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final exam	50.0%	60.0%
	Homework assignments	0.0%	20.0%
	Short tests	0.0%	20.0%

Recommended reading	Basic literature	J.Długosz, *Funkcje zespolone*, GiS
		Żakowski, W., Leksiński, W., *Podręczniki Akademickie - Matematyka. Część IV*, Wydawnictwo Naukowe PWN
		Hochstadt, H., *Integral Equations*, A Wiley-Interscience Publications
		M.Bednarczyk, A.Dąbrowicz-Tlałka, *Elementy rachunku prawdopodobieństwa w zadaniach; dla studentów uczelni technicznych*, Wyd.PG
	Supplementary literature	M.Gewert, Z.Skoczylas, *Równania różniczkowe zwyczajne*, GiS
		W.Sradomski, *Matlab. Praktyczny podręcznik modelowania,* Helion
		Krasnow, M. L., Kisielew, A. I., Makarenko, G. I., *Zadania z równań całkowych*, Wydawnictwo Naukowe PWN
	eResources addresses	Adresy na platformie eNauczanie: WETI – TKiS – Matematyka stosowana 2023/24 (M.Musielak) - Moodle ID: 36753 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36753

Example issues/ example questions/ tasks being completed	• Solve the given differential equation using Laplace transform • Use Z transform to solve the given difference equation • Evaluate the line integrals over complex functions • Analyze the frequency of the input signal when its Fourier transform is given.
Work placement	Not applicable