



Subject card

Subject name and code	Differential equations II, PG_00021047						
Field of study	Mathematics						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2023/2024		
Education level	second-cycle studies		Subject group		Optional subject group 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		exam		
Conducting unit	Department of Differential Equations and Mathematical Applications -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Agnieszka Bartłomiejczyk				
	Teachers		dr Agnieszka Bartłomiejczyk				
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: 30.0						
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		70.0	135
Subject objectives	Acquiring basic knowledge of qualitative theory of differential equations. Consolidating and developing the ability to solve ordinary differential equations and boundary value problems.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U09] Is able, at an advanced level and covering modern mathematics, to apply and present in speech and in writing the methods of at least one selected branch of mathematics: mathematical and functional analysis, theory of differential equations and dynamical systems, algebra and number theory, geometry and topology, calculus probability and statistics, discrete mathematics and graph theory, logic and set theory.		Students can study the stability of steady states and are able to solve boundary value problem.		[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	[K7_U04] Is familiar with the methods of solving classical ordinary and partial differential equations, is able to apply them in typical practical problems.		Students can find the right method for solving ordinary differential equations.		[SU4] Assessment of ability to use methods and tools		
	[K7_W10] Knows the numerical methods used to find approximate solutions to mathematical problems (e.g. differential equations) posed by applied fields (e.g. industrial technologies, management, etc.).		The student knows how to draw phase portraits.		[SW1] Assessment of factual knowledge		

Subject contents	<div>1. Elements of the theory of stability: the Lyapunov stability, stability of constant coefficient linear system, stability of solutions of n order linear equations, stability of solutions of nonlinear systems, the Lyapunov function.</div> <div>2. Boundary value problems: linear boundary value problem, the Green function for ODEs, properties of solutions of second-order linear differential equations, the Sturm comparative theorem, the Sturm-Liouville problem, periodic Sturm-Liouville problem.</div> <div>3. The Laplace transform: basic properties of the Laplace transform, Inverse Laplace transform. Using the Laplace transform method to solve the differential equation.</div>		
Prerequisites and co-requisites	The knowledge of Mathematical Analysis, Differential Equations I		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	50.0%	40.0%
	tests	50.0%	60.0%
Recommended reading	Basic literature	<div>1. Z. Kamont, Równania różniczkowe zwyczajne, Wydawnictwo Uniwersytetu Gdańskiego, 1999</div> <div>2. A. Pelczar, J. Szarski, Wstęp do teorii równań różniczkowych, PWN, 1984</div> <div>3. W. Walter, Ordinary differential equations, Springer, 1988</div>	
	Supplementary literature	<div>1. J. Banasiak, K. Szymańska-Dębowska, Układy dynamiczne w modelowaniu procesów przyrodniczych, społecznych i technologicznych, PWN, 2023.</div> <div>2. B.P. Demidowicz, Matematyczna teoria stabilności, WNT, 1972.</div> <div>3. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne, GiS, 2004.</div> <div>4. J. Muszyński, A.D. Myszkis, Równania różniczkowe zwyczajne, PWN, 1984.</div>	
	eResources addresses	Adresy na platformie eNauczanie: Równania różniczkowe II 2023/2024 - Moodle ID: 32803 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32803	
Example issues/ example questions/ tasks being completed	Give the definition of stability in the sense of Lyapunov. Sketch and interpret the phase portret for autonomous linear constant coefficient systems. Solve linear ordinary differential equations using Laplace transform.		
Work placement	Not applicable		

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