



## Subject card

Subject name and code	Differential equations II, PG_00021047						
Field of study	Mathematics						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2022/2023		
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			6.0		
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	45.0	30.0	0.0	0.0	0.0	75
E-learning hours included: 3.0							
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	75	5.0		70.0		150
Subject objectives	Acquiring basic knowledge of qualitative theory of differential equations and differential-functional equations. Consolidating and developing the ability to solve ordinary differential equations.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_U09	Students can study the stability of steady states and are able to solve simple differential inequality.			[SU4] Assessment of ability to use methods and tools		
	K7_U04	Students can find the right method for solving ordinary differential equations.			[SU4] Assessment of ability to use methods and tools		
	K7_W10	Students know approximate method for solving differential equations.			[SW1] Assessment of factual knowledge		
	K7_W01	The student has knowledge of the theory of ordinary differential equations.			[SW1] Assessment of factual knowledge		
K7_K02	Students understand the need to popularize the application of differential equations in fields such as physics, biology, medicine and economics.			[SK4] Assessment of communication skills, including language correctness [SK1] Assessment of group work skills			
Subject contents	<ol style="list-style-type: none"><li>Elements of the theory of stability: the Lyapunov stability, stability of constant coefficient linear system, stability of solutions of <math>n</math> order linear equations, stability of solutions of nonlinear systems, the Lyapunov function, other types of stability.</li><li>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.</li><li>The Laplace transform: basic properties of the Laplace transform, Inverse Laplace transform. Solving linear ordinary differential systems and differential-integral equations using Laplace transform.</li></ol>						
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
	talk	20.0%	10.0%
	tests	50.0%	60.0%
	exam	50.0%	30.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Z. Kamont, Równania różniczkowe zwyczajne, Wydawnictwo Uniwersytetu Gdańskiego, 1999</li> <li>2. A. Pelczar, J. Szarski, Wstęp do teorii równań różniczkowych, PWN, 1984</li> <li>3. W. Walter, Ordinary differential equations, Springer, 1988</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>1. B.P. Demidowicz, Matematyczna teoria stabilności, WNT, 1972.</li> <li>2. J. Muszyński, A.D. Myszkis, Równania różniczkowe zwyczajne, PWN, 1984</li> </ol>	
	eResources addresses	Adresy na platformie eNauczanie: Równania różniczkowe II 2022/2023 - Moodle ID: 27426 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=27426">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=27426</a>	
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		