GDAŃSK UNIVERSITY OF TECHNOLOGY

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

<table>
<tr><td>Subject contents</td><td>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.

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.

3. The Laplace transform: basic properties of the Laplace transform, Inverse Laplace transform. Using the Laplace transform method to solve the differential equation.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>The knowledge of Mathematical Analysis, Differential Equations I</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>exam</td><td>50.0%</td><td>40.0%</td></tr><tr><td>tests</td><td>50.0%</td><td>60.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>1. Z. Kamont, Równania różniczkowe zwyczajne, Wydawnictwo Uniwersytetu Gdańskiego, 1999
2. A. Pelczar, J. Szarski, Wstęp do teorii równań różniczkowych, PWN, 1984
3. W. Walter, Ordinary differential equations, Springer, 1988</td></tr><tr><td>Supplementary literature</td><td>1. J. Banasiak, K. Szymańska-Dębowska, Układy dynamiczne w modelowaniu procesów przyrodniczych, społecznych i technologicznych, PWN, 2023.
2. B.P. Demidowicz, Matematyczna teoria stabilności, WNT, 1972.
3. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne, GiS, 2004.
4. J. Muszyński, A.D. Myszkis, Równania różniczkowe zwyczajne, PWN, 1984.</td></tr><tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Równania różniczkowe II 2023/2024 - Moodle ID: 32803
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32803</td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>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.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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