

## 。 GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

Subject name and code	Differential equations in Physics and Technology, PG_00037294							
Field of study	Technical Physics							
Date of commencement of studies	October 2023		Academic year of realisation of subject			2024/2025		
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	2		Language of instruction			Polish		
Semester of study	3		ECTS credits			4.0		
Learning profile	general academic profile		Assessment form			assessment		
Conducting unit	Katedra Fizyki Atomowej i Luminescencji -> Faculty Of Applied Physics And Mathematics -> Wydziały Politechniki Gdańskiej							
Name and surname	Subject supervisor		dr hab. inż. Maciej Demianowicz					
of lecturer (lecturers)	Teachers		dr hab. inż. Maciej Demianowicz					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec	:t	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	ctivity Participation in classes includ plan		n didactic Participation in ed in study consultation hours		Self-study		SUM
	Number of study hours	60		4.0		36.0		100
Subject objectives	Students become acquainted with methods of solving most popular differential equations encountered in physics and technics.							
Learning outcomes	Course outcome		Subject outcome			Method of verification		
	[K6_W02] Has systematized knowledge of the basics of physics, including mechanics, thermodynamics, electricity and magnetism, optics, atomic and particle physics, solid-state physics, nuclear and elementary particle physics.		The student has a deep and structured knowledge in the field of the theory of differential equations and knows how to apply it to physics and technology.			[SW1] Assessment of factual knowledge		
	[K6_W03] Has systematized knowledge of higher mathematics, including algebra, analysis, probability theory and numerical methods, allowing for basic description, understanding and modelling of physical phenomena and some technical processes.		The student has a deep and structured knowledge in the field of the theory of differential equations and knows how to apply it to physics and technology.			[SW1] Assessment of factual knowledge		
	[K6_U02] Can analyze and solve simple scientific and technical problems, based on possessed knowledge, using analytical, numerical, simulation and experimental methods.		The student is able to solve scientific and technical problems requiring the ability to solve (mainly analyticaly) differential equations			[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		

Subject contents	<ol> <li>Ordinary differential equation, order and degree of the equation, solution of the equation, integral of the equation, integral curve. 2. Cauchy problem. 3. General, particular, and singular solutions. 4. First-order equations solved for the derivative. Existence and uniqueness of solutions.5. Separable First Order Differential Equations. 6. Homogeneous equation, Bernoulli equation.7. First-order linear equations. Properties, method of variation of constants, method of undetermined coefficients.8. Exact differential equations and integrating factor.9. Substitution method (introducing a parameter).10. Method of successive approximations.11. Higher-order linear equations (properties, reduction to other forms).12. Homogeneous linear equations. General solution. 13. Non-homogeneous linear equations. General solution. Method of variation of constants, method of undetermined coefficients.</li> <li>14. Linear equations with constant coefficients. Reducing an equation to one with constant coefficients.</li> <li>15. Second-order linear equations. Reduction to simpler forms. Constructing a second solution when the first is known.</li> <li>16. (Generalized) power series method.</li> </ol>					
Prerequisites and co-requisites	Good knowledge of mathematical analysis.					
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade			
and criteria	Grade	50.0%	100.0%			
Recommended reading	Basic literature	<ol> <li>N. M. Matwiejew, Metody całkowania równań różniczkowych zwyczajnych, PWN, Warszawa, 1982</li> <li>N. M. Matwiejew, Zadania z równań różniczkowych zwyczajnych, PWN, Warszawa 1976.</li> <li>W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, cz. II, PWN, Warszawa 1998.</li> <li>W. W. Stiepenew, Równania różniczkowo, DWN, Warszawa, 1956.</li> </ol>				
	eResources addresses	<ul> <li>2. M. Tenenbaum, H. Pollard, Ordinary differential equations', Dover, New York 1985.</li> <li>Adresy na platformie eNauczanie: Równania różniczkowe w fizyce i technice 2024-2025 - Moodle ID: 41689</li> <li>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=41689</li> </ul>				
Example issues/ example questions/ tasks being completed						
Work placement	Not applicable					

Document generated electronically. Does not require a seal or signature.