



Subject card

Subject name and code	, PG_00052287						
Field of study	Mathematics						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
Education level	second-cycle studies	Subject group			Specialty subject group 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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Divison of Dynamical Systems -> Institute of Applied Mathematics -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Sergey Kryzhevich				
	Teachers		dr hab. Sergey Kryzhevich				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	30.0	60
	E-learning hours included: 0.0						
	eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/edit.php?id=5221						
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	35.0	100		
Subject objectives	Introduction to basic tools and methods related to the theory of systems of nonlinear ordinary differential equations.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W01] has enhanced knowledge of basic branches of mathematics, demonstrates knowledge theorem and hypotheses, has understanding of the role and importance of mathematical reasoning structure.	The student is able to apply basic methods of linear algebra, mathematical analysis, functional analysis and other mathematical disciplines to solve systems of nonlinear ordinary differential equations or to carry them out for qualitative analysis.			[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation		
	[K7_K02] formulates questions to deepen own understanding of a given topic or find missing elements of reasoning, understands the need to clearly present selected achievements of higher mathematics to laymen.	The student knows and is able to apply basic facts from stability theory and some numerical methods for solving nonlinear systems.			[SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice		
	[K7_U07] at an advanced level and covering modern mathematics, applies and presents in speech and in writing the content and methods of a selected branch of mathematics	The student is able to solve autonomous linear systems and some nonlinear integrable systems.			[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		

Subject contents	Course content – lecture		
	1) General properties of nonlinear systems. Existence and uniqueness of solutions. 2) Homogeneous and inhomogeneous linear systems. 3) Fundamental matrices, Wronski determinants. 4) Systems with constant coefficients. Matrix exponents. 5) Euler's method. 6) Inhomogeneous systems and methods for solving them. 7) Dependence on initial conditions and parameters. 8) Stability. 9) Lyapunov functions. 10) Types of fixed points in the plane.		
	Course content – seminar The program of seminarium is similar.		
Prerequisites and co-requisites	Knowledge of subjects: Algebra, Analysis, Ordinary Differential Equations.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exercises	51.0%	50.0%
	Exam	51.0%	50.0%
Recommended reading	Basic literature	1.W. Żakowski, W. Leksiński, Matematyka, Część IV, Warszawa, 1995. 2. M. Gehwert, Z. Skoczylas, Równania różniczkowe zwyczajne: teoria, przykłady, zadania, Wrocław, 2001.	
	Supplementary literature	1. R.S. Guter, A.N. Janpolski, Równania różniczkowe, PWN, Warszawa, 1980. 2. W.I. Smirnow, Matematyka Wyższa, Tom II, PWN, Warszawa, 1966.	
	eResources addresses	Basic https://caiomp-zchdn7o2dcaci7ei4p8lnc.vpn.pg.edu.pl/2025/course/view.php?id=5221 -	
Example issues/ example questions/ tasks being completed	Students complete test works. Theoretical knowledge acquired in lectures and seminars is assessed in an exam. Example questions. 1) State and prove the properties of the matrix exponent. 2) State and prove the fixed point stability theorem. 3) Determine the type of fixed points for a system of two equations.		
Practical activities within the subject	Not applicable		

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