

於。GDAŃSK UNIVERSITY 奶 OF TECHNOLOGY

Subject card

Subject name and code	Bifurcation theory in differential equations, PG_00021514								
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			at the university			
Year of study	1		Language of instruction			Polish			
Semester of study	1		ECTS credits			4.0			
Learning profile	general academic profile		Assessment form			assessment			
Conducting unit	Department of Nonlinear Analysis and Statistics -> Faculty of Applied Physics and Mathematics					S			
Name and surname	Subject supervisor		dr inż. Robert Krawczyk						
of lecturer (lecturers)	Teachers		dr inż. Robert	Krawczyk					
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 Participation ir classes include plan		n didactic ed in study	Participation in consultation hours		Self-study SUM		SUM	
	Number of study 60 hours		5.0		35.0 100				
Subject objectives	The aim of the lecture is to introduce basic ideas and concepts of bifurcation theory in differential equations.								
Learning outcomes	Course out	come	Subject outcome			Method of verification			
	K7_U04		A student uses his knowledge from topology to study dynamical systems.			[SU2] Assessment of ability to analyse information			
	K7_W06		Student understans questions concerning new problems in bifurcation theory.			[SW1] Assessment of factual knowledge			
	K7_U06		Using simple examples student is able to explain the phenomenon of bifurcation.			[SU1] Assessment of task fulfilment			
	K7_W02		Student is able to describe stability property of a solution of differental equation by constructing appropriate dynamical system.			[SW1] Assessment of factual knowledge			
	K7_K02		student is able to decribe basic notions and methods of bifurcation theory by the use of elementary examples from mechanics, physics and biology.			[SK4] Assessment of communication skills, including language correctness			
Subject contents	Scalar autonomous equations. Elementary bifurcations.Computing bifurcation diagrams. Planar autonomous systems. Product systems. Properties of solutions of linear systems. Qualitative equivalence and bifurcations in linear systems. Liapunov functions. Poincare-Andronov-Hopf bifurcation.Structurally stable vector fields. Conservative and gradient systems.								
Prerequisites and co-requisites	Ordinary differential equations. Matematical analysis. Topology.								
Assessment methods	Subject passing criteria		Passing threshold			Percentage of the final grade			
and criteria	a completion of exercises		50.0%			50.0%			
	Colloquium		50.0%			50.0%			

Recommended reading	Basic literature	 J. Hale and H. Kocak, Dynamics and Bifurcations, Springer-Verlag, 1991, L. Perko, Differential Equations and Dynamical Systems, Springer- Verlag, 2001. 			
	Supplementary literature	E. Zehnder, Lectures on Dynamical Systems, EMS Textbooks in Mathematics, 2010.			
	eResources addresses	Adresy na platformie eNauczanie:			
Example issues/ example questions/ tasks being completed	Sketch the phase portraits on the circle and analyze the stability of equilibria of the followinf differential equation: x' = 1-2sin(x); Draw the orbits and the direction of the flow of the following system: x'=y(x ² -y ²), y'=-x(x ² -y ²);				
Work placement	Not applicable				