GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00035114					
Field of study	Mathematics					
Date of commencement of studies	October 2022		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		at the university	
Year of study	2		Language of instruction		Polish	
Semester of study	4		ECTS credits		3.0	
Learning profile	general academic profile		Assessment form		assessment	
Conducting unit	Department of Nonlinear Analysis and Statistics -> Faculty of Applied Physics and Mathematics					
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Marek Izydorek				
	Teachers	prof. dr hab. Marek Izydorek				

Lesson types and methods of instruction	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						

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	0.0	0.0	60

Subject objectives	The aim of the lecture is to introduce basic notions in the theory of differential forms.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K7_U13	Student is able to construct algorithms with good numerical properties to solve typical and nonstandard problems in the theory of differential forms.	[SU4] Assessment of ability to use methods and tools
	K7_W06	Student understands problems in the theory of differential forms under consideration also those on introductory research level.	[SW2] Assessment of knowledge contained in presentation
	K7_W08	Student knows methods of advanced calculus and understands limits of their applications.	[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
	K7_U10	Student is able to prove theorems in the theory of differential forms using methods of mathematical analysis, topology and differential geometry.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject

Subject contents	The space of p-vectors. Exterior products. LInear transformations. Inner products of p-vectors. The Hodge's operator. Differential form. Exterior derivative. Mappings and change of coordinates. Examples from mechanics. Converse to the Poincare Lemma. Moving frames .The Laplacian and orthogonal coordinates. Manifolds. Tangent bundles. Differential forms on manifolds. Euclidean simplices. Chains and boundaries. Integration of forms. Stoke's Theorem on manifolds. Periods and De Rham's Theorems.

Prerequisites and co-requisites	Mathematical analysis I-III. Topology. Differential geometry.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Evaluation of presentation in verbal and writting form	60.0%	100.0%

Recommended reading	Basic literature	1. Harley Flanders, Differential Forms with Applications to the Physical Sciences, Dover Publications, Inc. New York 1989. 2. Michael Spivak, Calculus on Manifolds, a Modern Approach to Classical Theorems of Advanced Calculus, Addison-Wesley Publishing Company, The Advanced Book Program, New York 1995. 3. David Bachman, A Geometric Approach to Differential Forms, Birkhauser 2006.
	Supplementary literature	No recommendations.
	eResources addresses	Adresy na platformie eNauczanie: Formy Różniczkowe - Moodle ID: 38439 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38439
Example issues/ example questions/ tasks being completed	Operator Alt defined on the space of k-tensors, properties, basic theorems together with sketches of proofs and examples.. Two hours presentation.	
Work placement	Not applicable	