

## 。 GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

Subject name and code	Topology, PG_00021501							
Field of study	Mathematics							
Date of commencement of studies	October 2022		Academic year of realisation of subject			2023/2024		
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			5.0		
Learning profile	general academic profile		Assessment form			exam		
Conducting unit	Faculty of Applied Physics and Mathematics							
Name and surname	Subject supervisor dr inż. Maciej Starostka							
of lecturer (lecturers)	Teachers		dr inż. Maciej Starostka					
			dr inż. Karol V	Vroński				
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	:t	Seminar	SUM
of instruction	Number of study	30.0	30.0	0.0	0.0		0.0	60
	E-learning hours inclu	1 Jded: 0.0						
Learning activity and number of study hours	Learning activity Participation in classes include plan		didactic Participation in consultation hours		Self-study SUM		SUM	
	Number of study 60 hours		5.0			60.0		125
Subject objectives	Introduction to topology of metric spaces, intuitions and proof techniques.							
Learning outcomes	Course outcome Subject outcome Method of verific					fication		
	K6_W07		The student knows the basic concepts and theorems of topology.			[SW1] Assessment of factual knowledge		
	K6_W04		The student knows the basic concepts and theorems of topology.			[SW1] Assessment of factual knowledge		
	K6_U03		The student knows how to use topological concepts in mathematical analysis.			[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
	K6_U09		The student is able to examine the properties of sets under different metrics.			[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	K6_U02		The student is able to prove elementary topological theorems.		[SU1] Assessment of task fulfilment			
Subject contents	Lectures: Metric spaces: metrics and metric space, examples. Notion of an open ball in metric space. Closed set. Kartesian product of metric spaces, Hilbert space. Topological spaces: topological space, examples. Interior, closure and boundary of a set in topological space. Dense subsets, dense countable subsets, separable spaces. Continuity and homeomorphisms: Continuity of a map in topological spaces. Equivalence of Heine and Cauchy conditions and continuity in metric spaces. Homeomorphism and homeomorphic spaces. Uniformly continuous mapsand Lipschitz functions in metric spaces. Complete metric spaces: Cauchy sequences and complete metric spaces. Banach space. Cantor's theorem and Banach theorem with applications. Theorem on embedding of metric spaces in complete metric spaces. Compact sets. Cantor set and its' properties , examples of non-typical continuous functions constructed by use of this set. Tichonov theorem. Hilbert cube. Boundary sets and nowhere dense sets, Baire theorem. Connectedness: Connected spaces and their properties. The interval [0,1] is connected. Properties of continuous maps on compact sets with each spaces. Closure and cartesian product of connected spaces. Path connected and locally path connected spaces. Warsaw circle and harmonic fan. Excercises: Examples and notions from lectures will be discussed, elementary theorems will be proved, geometric problems will be solved.							

Prerequisites and co-requisites	Knowledge of some notions from mathematical analysis and set theory.					
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade			
	written exam	50.0%	50.0%			
	activity	0.0%	10.0%			
	Midterm colloquium	50.0%	40.0%			
Recommended reading	Basic literature	<ol> <li>H. Patkowska, Wstęp do topologii, PWN, Warszawa-Poznań, 2000.</li> <li>K. Kuratowski, Wstęp do teorii mnogości i topologii, PWN, Warszawa, 1972.</li> <li>R. Duda, Wprowadzenie do topologii I/II, PWN, Warszawa, 1986.</li> </ol>				
	Supplementary literature	K. Sieklucki, Geometria i Topologia cz. I, Geometria, PWN, Warszawa 1978. K. Sieklucki i R. Engelking, Geometria i Topologia cz. II, Topologia, PWN, Warszawa 1980.				
	eResources addresses	Adresy na platformie eNauczanie: Topologia 2023/2024 - Moodle ID: 32399 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32399				
Example issues/ example questions/ tasks being completed	Investigate properties of the set {(x,y}: $\sqrt{(x-1)^2 + (y-1)^2} \le 1$ } with various metrics					
Work placement	Not applicable					

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