GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Topology, PG_00021501		
Field of study	Mathematics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	Institute of Applied Mathematics -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Zdzisław Dzedzej	
	Teachers	dr hab. Zdzisław Dzedzej dr inż. Maciej Starostka	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	30.0	0.0	0.0	0.0	60

E-learning hours included: 0.0

eNauczanie source addresses:

Moodle ID: 1065 Topologia
https://enauczanie.pg.edu.pl/2025/course/view.php?id=1065

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	60.0	125

Subject objectives

Introduction to topology of metric spaces, intuitions and proof techniques.

Learning outcomes

Course outcome	Subject outcome	Method of verification
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_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_W07	The student knows the basic concepts and theorems of topology.	[SW1] Assessment of factual knowledge
K6_U02	The student is able to prove elementary topological theorems.	[SU1] Assessment of task fulfilment
K6_W04	The student knows the basic concepts and theorems of topology.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>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. Compactness: Compact sets and their characterizations. Properties of continuous maps on 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 connected sets. 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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of some notions from mathematical analysis and set theory.</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>activity</td><td>0.0%</td><td>10.0%</td></tr>
<tr><td>Midterm colloquium</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>written exam</td><td>50.0%</td><td>40.0%</td></tr>
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</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. H. Patkowska, Wstęp do topologii, PWN, Warszawa-Poznań, 2000.

2. K. Kuratowski, Wstęp do teorii mnogości i topologii, PWN, Warszawa, 1972.

3. R. Duda, Wprowadzenie do topologii I/II, PWN, Warszawa,1986.</td></tr>
<tr><td>Supplementary literature</td><td>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.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Investigate properties of the set {(x,y): (x-1)^2+(y-1)^2 <=1} with various metrics</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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