GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Algebraic topology, PG_00069467		
Field of study	Topologia algebraiczna		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Differential Equations and Mathematical Applications -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Grzegorz Graff	
	Teachers	prof. dr hab. Grzegorz Graff Patryk Topór	

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/moodle/course/view.php?id=46885

Moodle ID: 46885 Topologia algebraiczna 2025/26
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=46885

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

The aim of the course is to familiarize students with the basic concepts and theorems in the field of algebraic topology.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W02] has enhanced knowledge of a selected branch of mathematics,theoretical or applied, knows classical definitions and theorems and their proofs and connections with other fields,understands problems being examined	Student: – gives examples of fundamental groups of basic elementary spaces, – is able to define a fundamental group, – gives examples of homologies of basic spaces, – defines the topological degree and provides its applications.	[SW1] Ocena wiedzy faktograficznej [SW2] Ocena wiedzy zawartej w prezentacji
[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.	Student: – gives examples of fundamental groups of basic elementary spaces, – is able to define a fundamental group, – gives examples of homologies of basic spaces, – defines the topological degree and provides its applications.	[SW1] Ocena wiedzy faktograficznej [SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
[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	"Student: – is able to independently prepare and deliver a presentation based on a scientific article related to the lecture topic, – distinguishes spaces up to homotopy type, – computes the topological degree.	[SU2] Ocena umiejętności analizy informacji [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu
[K7_U05] recognize topological structures in mathematical objects occurring, for example, in geometry or mathematical analysis; uses the basic topological properties of sets, functions and transformations, uses the language and methods of functional analysis	Student: – gives examples of fundamental groups of basic elementary spaces, – is able to define a fundamental group, – gives examples of homologies of basic spaces, – defines the topological degree and provides its applications.	[SU1] Ocena realizacji zadania [SU4] Ocena umiejętności korzystania z metod i narzędzi [SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania

Subject contents

Categories and functors. Operations on spaces. TCell complexes. opological invariants. Classification of surfaces. Homotopy of maps, homotopy equivalence. Homotopy of paths, fundamental group. Fundamental group of a circle. Covering spaces. Homotopy lifting. Deck transformation group. Relation between fundamental group and first homology group. Singular and simplicial homology. Exact sequences, Mayer-Vietoris sequence. Mapping degree and some applications. Cohomology rings. Applications of topological methods in other branches of mathematics as well as in physics, biology and in other fields of science.

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Prerequisites and co-requisites

Linear algebra. Algebra I. Algebra II. Topology.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Presentation	50.0%	40.0%
Written exam	50.0%	40.0%
Activity during classes	50.0%	20.0%

Recommended reading

Basic literature	C. Kosniowski, Wprowadzenie do topologii algebraicznej, Wydawnictwo UAM R. Duda, Wprowadzenie do topologii tom II, PWN Warszawa 1986 A. Hatcher, Algebraic topology, Cambridge Univ.Press http:// www.math.cornell.edu/ hatcher
Supplementary literature	1. Massey W.S., A Basic Course in Algebraic Topology, Springer-Verlag, 1991.
eResources addresses	

Example issues/ example questions/ tasks being completed

The definition of the primary group. Examples of homotopy and homology groups. Mathematical description of a Mobius strip.

Practical activites within the subject

Not applicable

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