GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Algebraic topology, PG_00021037						
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	3		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Differential Equations and Mathematical Applications -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Grzegorz Graff				
	Teachers		prof. dr hab. Grzegorz Graff				
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		5.0		60.0	125
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_U02	Student: - can independently prepare and present a presentation based on a scientific article related to the topic of the lecture - distinguishes between spaces with homotopic accuracy, - calculates the topological degree	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
	K7_W01	Student: - can independently prepare and present a presentation based on a scientific article related to the topic of the lecture - distinguishes between spaces with homotopic accuracy, - calculates the topological degree	[SW1] Assessment of factual knowledge
	K7_U09	Student: - can independently prepare and present a presentation based on a scientific article related to the topic of the lecture - distinguishes between spaces with homotopic accuracy, - calculates the topological degree	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
	K7_W03	Student: - gives examples of fundamental groups of elementary spaces, - can define a fundamental group, - gives examples of homology of basic spaces, - defines a topological degree and lists its applications.	[SW1] Assessment of factual knowledge
	K7_U06	Student: - gives examples of fundamental groups of elementary spaces, - can define a fundamental group, - gives examples of homology of basic spaces, - defines a topological degree and lists its applications.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information

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.

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
	Activity during classes	50.0%	20.0%
	Written exam	50.0%	40.0%
	Presentation	50.0%	40.0%

| 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 |
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| | Supplementary literature | 1. Massey W.S., A Basic Course in Algebraic Topology, Springer-Verlag, 1991. |
| | eResources addresses | Adresy na platformie eNauczanie: Topologia algebraiczna 2023/24 - Moodle ID: 30932 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30932 |

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.

Work placement	Not applicable