

Subject card

Subject name and code	Topology II, PG_00155559						
Field of study	Mathematics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2025/2026		
Education level	Master's studies		Subject group		Optional subject group Specialty subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		6.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Maciej Mroczkowski				
	Teachers		dr hab. Maciej Mroczkowski				
Lesson types	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						
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		10.0		80.0	150
Subject objectives	Improving the skills related to proving statements. Mastering the material. Preparation for the course Algebraic topology and possible writing of a master's thesis in topology.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[MATMU2_W03] knows and understands in-depth a selected field of theoretical or applied mathematics and is able to understand the formulations of issues in this field that are still at the research stage and knows the connections of issues in this field with other areas of mathematics	knows and understands - various methods of defining and constructing general topological spaces, various topological properties and theorems relating to them; the concept of homotopy and the construction of the fundamental group and their basic properties; can use these tools to explore certain spaces - a way to expand the scope of topology to include elements of general topology and homotopy theory	[SW4] test/exam - oral or written [SW2] presentation/project/paper/report
	[MATMU2_W02] knows and understands well the role and importance of the construction of mathematical reasoning	knows and understands: - various methods of defining and constructing general topological spaces, various topological properties and theorems relating to them; the concept of homotopy and the construction of the fundamental group and their basic properties; can use these tools to explore certain spaces - new constructions of topological spaces and constructions of the basic group and their importance in the study of spaces	[SW4] test/exam - oral or written [SW2] presentation/project/paper/report
	[MATMU2_U07] is able to define his/her interests and develop them; in particular, is able to establish contact with specialists in his/her field, e.g. understand their lectures intended for young mathematicians	can establish contacts with specialists in their field, e.g. understand their lectures intended for young mathematicians	[SU8] observation of student's independent or team work
	[MATMU2_U03] can understand mathematical texts of various types from selected fields of mathematics	demonstrates an understanding of mathematical reasoning in the field of topology	[SU1] oral statement/conversation/discussion [SU2] presentation/project/paper/report
	[MATMU2_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; ethical conduct	is ready to understand the importance of intellectual honesty and ethical conduct	[SK1] oral statement/conversation/discussion
	[MATMU2_K06] is ready to formulate opinions on basic mathematical issues	is ready to formulate opinions on basic mathematical issues	[SK1] oral statement/conversation/discussion
	[MATMU2_K02] is ready to precisely formulate questions to deepen his/her understanding of a given topic or find missing elements of reasoning	is ready to precisely formulate questions regarding topology II	[SK2] presentation/project/paper/report [SK4] test/exam - oral or written
	[MATMU2_U06] is able to apply methods and examples from a selected field of mathematics in related fields	in some proofs he uses methods from algebra	[SU2] presentation/project/paper/report [SU4] test/exam - oral or written
	[MATMU2_U04] is able, at an advanced level and including modern mathematics, to apply and present, orally and in writing, methods of at least one selected branch of mathematics	can present solutions to tasks prepared at home, solve problems from a set of exercises and present these proofs	[SU2] presentation/project/paper/report
	[MATMU2_U05] can perform proofs in a selected field and, if necessary, also use tools from other areas of mathematics	in some proofs he uses methods from algebra	[SU2] presentation/project/paper/report [SU4] test/exam - oral or written
	[MATMU2_K01] is willing to acknowledge the limitations of his or her own knowledge and is willing to pursue further education	is willing to acknowledge the limitations of his or her own knowledge and pursue further education	[SK1] oral statement/conversation/discussion
	[MATMU2_K05] is ready to independently search for information in literature, also in foreign languages	is ready to independently search for information in the literature	[SK2] presentation/project/paper/report

	Course outcome	Subject outcome	Method of verification
	[MATMU2_W01] knows and understands in-depth the theory of selected areas of mathematics	knows and understands how to extend the scope of topology to include elements of general topology and homotopy theory	[SW2] presentation/project/paper/report
	[MATMU2_U01] can construct mathematical reasoning: prove theorems and refute hypotheses through construction and selection of counterexamples	can construct mathematical reasoning in the field of topology, conduct proofs during the exam	[SU2] presentation/project/paper/report [SU4] test/exam - oral or written
Subject contents	1. Basic topological concepts (topological space, basis, subbasis, closed sets, maps, homeomorphisms and topological invariants, separation axioms, Urysohn's lemma, Tietze-Urysohn theorem)2. Operations on spaces (subspace, disjoint sum, Cartesian product, quotient space)3. Compactness (local compactness, compact extensions, Tikhonov's theorem, paracompactness)4. Meterizable spaces		
Prerequisites and co-requisites	Knowledge of basic concepts and theorems in metric topology.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Observation of the student's attitude	51.0%	0.0%
	Presentation of solutions to problems during exercises	51.0%	40.0%
	Exam	51.0%	60.0%
Recommended reading	Basic literature	1. R. Duda Wprowadzenie do topologii, część I , PWN Warszawa, 1986 2. R. Engelking, Topologia ogólna, PWN Warszawa, 1989 3. M.J.Greenberg, Wykłady z topologii algebraicznej, PWN Warszawa 1980 4. E. Dudek, Zbiór zadań do wykładu fakultatywnego "Topologia II", praca mgr UG, skrypt kserograficzny.	
	Supplementary literature	not applicable	
	eResources addresses		
Example issues/ example questions/ tasks being completed	not applicable		
Work placement	Not applicable		

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