



Subject card

Subject name and code	Introduction to the measure theory, PG_00021502						
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		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Nonlinear Analysis and Statistics -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Piotr Bartłomiejczyk				
	Teachers		mgr inż. Tomasz Gzella dr hab. Piotr Bartłomiejczyk				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	30.0	0.0	0.0	0.0	45
	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	45		5.0		50.0	100
Subject objectives	Equip students with specialized mathematical tools aided for technical subjects.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U01		The student can formulate and prove the basic properties of Jordan measure, Lebesgue measure and abstract measure.		[SU2] Assessment of ability to analyse information		
	K6_U04		The student is able to count the Lebesgue measure of some sets, such as polygons on the plane, with the help of boundary transitions.		[SU4] Assessment of ability to use methods and tools		
	K6_W02		The student is able to show that all the assumptions in Fatou's Lemma, the Monotonic Convergence Theorem and the Convergence Constraint Theorem are valid		[SW1] Assessment of factual knowledge		
	K6_U03		The student knows the differences between algebra and sigma-algebra and understands the consequences of these differences when constructing Jordan measure and Lebesgue measure.		[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	K6_U06		The student can give an example of a function that is integral in the Lebesgue sense, but not integral in the Riemann sense,		[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		

Subject contents	1. Theory of the integral 1.1 The extended set of real numbers 1.2 Measurable sets and functions 1.3 Limes inferior 1.4 Simple functions 1.5 Measures 1.6 Examples of spaces with measure 1.7 Operations in the set $[0, \infty]$. 1.8 Integration of positive functions 1.9 Integration of complex functions 1.10. sets of measure zero 2. positive Borel measures 2.2 Riesz's representation theorem 2.3 Regularity of Borel measures 2.4 Lebesgue measure 2.5 Continuity vs. measurability 3. Complex measures 3.1 Variation of a measure 3.2 Positive and negative variation 3.3 Absolute continuity 3.4 Radon-Nikodym theorem		
Prerequisites and co-requisites	set theory, calculus		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Colloquium no 2	51.0%	50.0%
	Colloquium no 1	51.0%	50.0%
Recommended reading	Basic literature	1) Walter Rudin, Real and complex analysis, PWN, 1986.	
	Supplementary literature	1) P. Billingsley, Probability and measure, . PWN 1979. 2) K. Maurin, Analysis, PWN 1973.	
	eResources addresses	Adresy na platformie eNauczanie: Wstęp do teorii miary wykład 2023/2024 - Moodle ID: 32753 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32753 Wstęp do teorii miary - 23/24 ćw. - Moodle ID: 28729 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=28729	
Example issues/ example questions/ tasks being completed	Give the definition of measure and compute the measure of some sets. Discuss the construction of integrals with respect to measure. Formulate and prove the monotone convergence theorem.		
Work placement	Not applicable		

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