GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Introduction to the measure theory, PG_00021502
Field of study	Wstęp do teorii miary

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	4.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Divison of Differential Equations and Applications of Mathematics -> Institute of Applied Mathematics -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej
Name and surname of lecturer (lecturers)	Subject supervisor — dr hab. Piotr Bartłomiejczyk
	Teachers — mgr inż. Tomasz Gzella; dr hab. Piotr Bartłomiejczyk

Lesson types	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						
	eNauczanie source addresses:						
	Moodle ID: 1918 Wstęp do teorii miary wykład 2025/2026 https://enauczanie.pg.edu.pl/2025/course/view.php?id=1918						
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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] Ocena umiejętności analizy informacji
	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] Ocena umiejętności korzystania z metod i narzędzi
	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] Ocena wiedzy faktograficznej
	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.	[SU4] Ocena umiejętności korzystania z metod i narzędzi [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu
	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,	[SU4] Ocena umiejętności korzystania z metod i narzędzi [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu

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	

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.

Practical activites within the subject	Not applicable

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