GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Probability Theory, PG_00023758						
Field of study	Mathematics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
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	4		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Probability Theory and Biomathematics -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Wojciech Bartoszek				
	Teachers						

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	5.0	35.0	100

Subject objectives	Introduction to basic notions of modern probability based on measure theory. Equipping a student in the knowledge necessary for understanding randomness and relevant interaction with the surrounding environment and sociopolitical reality.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_U11	Precisely describes different types of random events using the language of axiomatic probability theory.	[SU3] Assessment of ability to use knowledge gained from the subject
	K6_U01	Applies probability theory to technology.	[SU1] Assessment of task fulfilment
	K6_U03	Recognizes conditional probability, independence of events and random variables.	[SU4] Assessment of ability to use methods and tools
	K6_W04	Uses methods of logic, analysis, algebra and measure theory in probability.	[SW1] Assessment of factual knowledge
	K6_U02	Explains different nodes of stochastic convergence.	[SU1] Assessment of task fulfilment

Subject contents	Course content – lecture LECTURES Combinatorial and geometrical probability. Axioms of modern probability theory, probability space. Conditional probability, partition equation, Bayes theorem. Independence of events and Bernoulli scheme. Borel-Cantelli theorem. Measure extension problem. Caratheodory theorem. Random variable. Distribution function and its properties. Random variables with continuous, absolutely continuous and singular distributions. Lebesgue integral and its basic properties. Expectation value of a random variable. L^p spaces. Variance of random variable and its properties. Schwarz and Jensen inequalities. Fatou lemma. Lebesgue and Beppo-Levy convergence theorems. Fubini theorem. Independent random variables. Different nodes of convergence of random variables. Convolutions. TUTORIALS During tutorial classes (closely correlated with lectures) students solve numerical exercises and selected theoretical problems.

Prerequisites and co-requisites	Courses completed: Mathematical Analysis (MAT1001), Discrete Mathematics (MAT1006), Introduction to Measure Theory (MAT1011)

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Activity/quizes	51.0%	16.0%
	Test 1	51.0%	35.0%
	Projects	51.0%	14.0%
	Test 2	51.0%	35.0%

Recommended reading	Basic literature	J.Jakubowski, R.Sztencel, Wstęp do teorii prawdopodobieństwa, Wydawnictwo SCRIPT, Warszawa, 2010.
		J.Jacod, P.Protter, Probability Essentials, Springer, Berlin Heidelberg, 2000.
		W.Feller, Wstęp do rachunku prawdopodobieństwa, t.I i II, PWN, Warszawa, 2009.
	Supplementary literature	I.I.Gichman, A.W.Skorochod, Wstęp do teorii procesów stochastycznych, PWN, Warszawa, 1968.
		P.Billingsley, Prawdopodobieństwo i miara, PWN, Warszawa, 1987.
		G.Grimmett, D.Stirzaker, Probability and Random Processes, Oxford University Press, 2006.
		R.Magiera, Modele i metody statystyki matematycznej, GiS, Wrocław, 2002.
	eResources addresses	

| Example issues/ example questions/ tasks being completed | At the beginning of the term students are provided with the list of problems and exercises to be solved or worked out by themselves. Their solutions are presented on exercises where students give their comments and suggest improvements. Test problems are based on mentioned lists and topics from lectures.

Solve urn problem. Find the expectation and variance. Study independence. Find a linear regression. Evaluate the failure probability. Find distribution of a random variable. |
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Practical activites within the subject	Not applicable

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