GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Probability Theory, PG_00023758		
Field of study	Mathematics		
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	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		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Wojciech Bartoszek	
	Teachers		

Lesson types and methods of instruction

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

Adresy na platformie eNauczanie:

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_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
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

Subject contents

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.		
Work placement	Not applicable		