GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Risk Processes, PG_00044138
Field of study	Mathematics

Date of commencement of studies	October 2023	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	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	5.0
Learning profile	general academic profile	Assessment form	exam

Conducting unit	Divison of Dynamical Systems -> Institute of Applied Mathematics -> Faculty of Applied Physics and Mathematics

Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Sergey Kryzhevich
	Teachers	dr hab. Sergey Kryzhevich

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	30.0	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	60.0	125

Subject objectives	Introduction of basic mathematical tools related to risk modeling in terms of stochastic (Markov) processes and stochastic differential equations.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U11] Can construct mathematical models used in specific advanced applications of mathematics, can use stochastic processes as a tool for modeling phenomena and analyzing their evolution.	Student can resolve basic issues related to construction mathematical models of processes of risks, including bankruptcy.	[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information
	[K7_U04] Is familiar with the methods of solving classical ordinary and partial differential equations, is able to apply them in typical practical problems.	Student can analyze continuous Markow processes modelling risks.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools
	[K7_W09] Knows the rules of stochastic modeling in financial and actuarial mathematics or in natural sciences, in particular physics, chemistry or biology.	Applies stochastics processes in engineering problems, in particular in insurance risk modeling or survival analysis.	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation
	[K7_K04] Can form opinions on fundamental mathematical issues.	Student solves mathematical problems resulting from adopted risk assessment models e.g. in relation to bunkruptcy.	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents	Markovian processes with discrete time. Elements of the Itô integral. Stochastic differential equations. Standard risk models in terms of stochastic differential equations. The Black - Sholes and Ornstein - Uhlenbeck models. Reduced insolvency risk model. During the seminars accompanying the lecture, students will present issues related to survival analysis.
Prerequisites and co-requisites	Assessment in the following subjects: probability calculus, stochastic processes

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	51.0%	50.0%
	Project	51.0%	50.0%

Recommended reading	Basic literature	1. Steven E. Shreve, Stochastic Calculus for Finance II. Continuous-Time Models. Springer, 2004. 2. Robert A. Jarrow, Continuous-Time Asset Pricing Theory. A Martingale-Based Approach. Springer, 2018. 3. D.G. Kleinbaum, M. Klein, Survival Analysis, A Self-Learning Text, (3rd Edition), Springer
	Supplementary literature	1. Ioannis Karatzas and Steven E. Shreve. Brownian Motion and Stochastic Calculus. Springer, 1991. 2. Tomasz R. Bielecki, Marek Rutkowski, Credit Risk: Modeling, Valuation and Hedging, Springer, 2004. 3. Olav Kallenerg, Foundations of Modern Probability. Springer, 2002.
	eResources addresses	Podstawowe https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38042 - The Risk Processes course at e-nauczanie platform Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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