GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Stochastic integral, PG_00021509		
Field of study	Mathematics		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
Education level	second-cycle studies	Subject group	Optional subject group 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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Nonlinear Analysis and Statistics -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Tomasz Szarek	
	Teachers	dr Wojciech Czernous prof. dr hab. inż. Tomasz Szarek	

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

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

Main aim is to equip the student is advanced mathematical tools in technical subjects.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_W02	Students knows the constructions of stochastic integrals and can recognize the difference among them.	[SW1] Assessment of factual knowledge
K7_W04	Student knows advanced theorems of stochastic integral.	[SW1] Assessment of factual knowledge
K7_U10	Student can proved the existence of thestochastic integral and can count it applying basic theorems of stochstic integrations	[SU4] Assessment of ability to use methods and tools
K7_K03	Students can solve problems of stochastic integrations in groups.	[SK1] Assessment of group work skills
K7_U06	Student can proved the existence of thestochastic integral and can count it applying basic theorems of stochstic integrations	[SU4] Assessment of ability to use methods and tools

Subject contents

Probability spaces with filtraation. Stochastic basis. Stoping times and their basic properties. Classyfication of stoping times. Optional i prognose sigam-algebras. Increasin processes, processes with finite wariation and processes with integrable wariation. Localization. martingales with continuous time. and their basic properties. The Doob-Meyer decomposition. Square integrable martingales. Stochastic integral with respect to local martingales with continuous paths.and their basic properties. Ito's formula and it applications.. The Girsanov theorem. The decomposition of lokal martingales. Stochastic integral with respect to local martingales and semimartingales.

Prerequisites and co-requisites

Probability theory, measure theory and functional analysis.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Colloquium 1	51.0%	20.0%
Exam	51.0%	60.0%
Colloquium 2	51.0%	20.0%

Recommended reading	Basic literature	1) R. Elliot: Stochastic calculus and applications, Springer 1982. 2) H. Kuo, Introduction to stochastic integration, Springer 2006.
	Supplementary literature	1) C. Dllecherie, P..A. Meyer, Probabilities and potential, tom 2., North-Holland 1982.. 2) P. Protter, Stochastic Integration and differential equations, Springer 1990. 3) O. Kallenberg, Foundations of modermn probability, Springer 2001. 4) Sheng-wu He, Jia-gang Wang, Jia-an Yan, Semimartingale theorey and stochastic calculus, Science Press, New York 1992.
	eResources addresses	Adresy na platformie eNauczanie: Całka stochastyczna - Moodle ID: 31019 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=31019
Example issues/ example questions/ tasks being completed	Discuss the construction of stochastic integrals with respect to local martingales with continuous paths. Give the general stopping theorem. Give the Ito formula and proved it.	
Work placement	Not applicable	