Subject card

Subject name and code	Stochastic integral, PG_00021509					
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		Optional subject group Subject group related to scientific research in the field of study	
Mode of study	Full-time studies		Mode of delivery		blended-learning	
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 -> Wydziały Politechniki Gdańskiej					
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Tomasz Szarek			
	Teachers		prof. dr hab. inż. Tomasz Szarek Gabriela Łuczyńska			

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: 30.0						

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_U06] Has the ability to recognize topological structures in mathematical objects occurring, for example, in geometry or mathematical analysis; is able to use the basic topological properties of sets, functions and transformations, uses the language and methods of functional analysis in the problems of mathematical analysis and its applications, in particular uses the properties of classical Banach and Hilbert spaces.	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_U10] In a selected field, can examine evidence, in which, if necessary, also can use tools from other branches of mathematics, can identify one's own interests and develop them; in particular, is able to establish contact with specialists in their field, e.g. understand their lectures intended for young mathematicians.	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_W02] Has good understanding of the role and importance of mathematical reasoning structure.	Students knows the constructions of stochastic integrals and can recognize the difference among them.	[SW1] Assessment of factual knowledge
	[K7_W04] Has enhanced knowledge of a selected branch of mathematics, theoretical or applied.	Student knows advanced theorems of stochastic integral	[SW1] Assessment of factual knowledge

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 2	51.0%	20.0%
	Exam	51.0%	60.0%
	Colloquium 1	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	Podstawowe
		https://enauczanie.pg.edu.pl/moodle/course/view.php?id=31019 -
		Adresy na platformie eNauczanie:
		Całka stochastyczna 23/24 - Moodle ID: 37728
		https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37728
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	

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