Course code	
Type and description	Background Course
ECTS credit	2
Course name	Stochastic Processes
Course name in Polish	Procesy stochastyczne
Language of instruction	English
Course level	8 PRK
Course coordinator	dr hab. Andrzej Okolewski, prof. uczelni
Course instructors	dr hab. Andrzej Okolewski, prof. uczelni

Delivery methods and course duration

	Lecture	Tutorials	Laboratory	Project	Seminar	Other	Total of teaching hours during semester
Contact hours	15	0	0	0	0	0	15
E-learning	No	No	No	No	No	No	
Assessment criteria (weightage)	1,00					0,00	

Course objective

The aim of the course is:

1. to enable the acquisition of knowledge and skills in stochastic processes

2. to enable the acquisition of knowledge of elementary properties/theorems concerning stochastic processes

3. to enable the acquisition of elementary knowledge of applications of stochastic processes in other sciences

Learning outcomes

After completing the course students can:

1. formulate the definition/properties of the conditional expectation with respect to a sigma-field – effects W1, W4, U3

2. give definitions/properties of basic stochastic processes, describe their types and give their probabilistic properties – effects W1, W4, U3

3. apply the above knowledge to analyse mathematical models – effects U3, K1, K2

Assessment methods

Learning outcomes 1—3 (effects W1, W4, U3, K1, K2): oral exam

Prerequisites

The student has the knowledge and skills in the basics of probability, measure and integral theory.

Course content with delivery methods

LECTURE

1. Definition and properties of the conditional expectation with respect to a sigma-field.

2. Definition of a stochastic process. The Kolmogorov Existence Theorem.

3. Basic characteristics of stochastic processes. Stationary processes. The Poisson process. The Wiener process.

	4. Stopping times. Martingales, submartingales, supermartingales. Doob's optional stopping theorem. Wald's identities. Doob's decomposition theorem. 5. Markov processes, Markov chains, ergodic theorem.
Basic reference materials	1. Kallenberg O. (2002) Foundations of Modern Probability, 2nd ed. Springer. 2. Resnick S.I. (2013). Adventures in Stochastic Processes. Springer 3. Williams D. (2019) Probability with Martingales, 2nd ed. Cambridge University Press
Other reference materials	4. Rolski T., Schmidli H., Schmidt V., Teugels J.L. (1999) Stochastic Processes for Insurance and Finance. John Wiley and Sons
Average student workload outside classroom	35h
Comments	
Last update	