Subject code	ECTS credits
MAT4004	6

Course title in Lithuanian

ATSITIKTINIAI PROCESAI

Course title in English

RANDOM PROCESSES

Short course annotation in Lithuanian (up to 500 characters)

Atsitiktinio proceso sąvoka, jų pasiskirstymo ir skaitinės charakteristikos. Atsitiktinių procesų klasifikacija. Sąlyginės tikimybės ir matematinės viltys. Atsitiktiniai klaidžiojimai. Atspindžio principas. Arksinuso dėsnis. Martingalai. Markovo grandinės. Būsenų klasifikacija. Homogeninės Markovo grandinės. Besišakojantys procesai. Brauno judesys. Levy procesai ir jų savybės.

Short course annotation in English (up to 500 characters)

Notion of random process. Distribution and numerical characteristics. Classification of random processes. Conditional probability and mathematical expectations. Random walk. Reflection principle. Arcsine law. Martingale. The classifications of states of Markov chains. Branching processes. Levy processes and their properties.

Prerequisites for entering the course

Mathematical Analysis, Probability Theory, Mathematical Statistics

Course aim

Course aim is to provide understanding of random processes.

Links between course outcomes, criteria of learning achievement evaluation, study methods and methods of learning achievement assessment

No	Course outcomes	Criteria of learning achievement evaluation	Study methods	Methods of learning achievement assessment
1.	Knowledge on random processes and their classification	Student has deep understanding about random processes and their classification	Lectures, practical works, individual work, consulting	Mid-term exam, Assessment of practical works
2.	Knowledge how to calculate conditional mathematical expectations	Student is able to calculate conditional probability and mathematical expectations	Lectures, practical works, individual work, consulting	Final exam, Assessment of practical works
3.	Knowledge on propositions and proofs of this course	Student is able to demonstrate knowledge on main propositions of this course and to prove them	Lectures, practical works, individual work, consulting	Mid-term exam, final exam, assessment of practical works

Links between study programme outcomes and course outcomes

Study programme outcomes	Running number of course outcome		
	1	2	3
Know and comprehend concepts and propositions of fundamental mathematical subjects, recognize and apply them solving practical/theoretical tasks	+	+	+

Identify the problem, collect and analyze real/theoretical data using various mathematical methods, tools and IT technologies		+	+
Operating with formal mathematical symbols and terms, determine mathematical connections between various mathematical quantities; conceive mathematical propositions and logical proofs, construct and prove new statements	+	+	+
Think logically and analytically, evaluate alternative ways of task solving and implement optimal solutions		+	+

Content

No	Content (topics)
1.	Classification of random processes.
2.	Markov chains.
3.	Continuous random process.
4.	Kolmogorov equations.
5.	Infinitely divisible distributions.
6.	Lévy processes.
7.	Student – Lévy processes.

Distribution of workload for students (contact and independent work hours)

Lectures	**45 hours**
Seminars	**30 hours**
Individual students work	**85 hours**
Total:	**160 hours**

Structure of cumulative score and value of its constituent parts

Final written exam (50%), mid-term written exam (25%), assessment of practical work (25%).

Recommended reference materials

No	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	*Self study rooms*	*Other libraries*
Basic materials						
1.	1988	Gnedenko B.V. The Theory of Probability	Mir, Moscow		1	
2.	2013	Grigelionis B. Students t-Distribution and Related Stochastic Processes	Sringer		1	
3.	1996	Kubilius J. Tikimybių teorija ir matematinė statistika (Probability Theory and Mathematical Statistics)	Vilnius, Mokslas	50	1	
4.	1999	Sato K., Lévy M. Processes and Infinitely Divisible Distributions	Cambridge University Press, Cambridge		1	
5.	2004	Shiryaev A.N. Probability	Springer		1	
Supplementary materials						
1.	2000	Aksomaitis A. Tikimybių teorija ir statistika (Probability Theory and Statistics)	Kaunas, Technologija			

Course programme designed by

Prof. habil. dr. Algimantas Bikelis