RTU Course "Random Processes"

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General data

Code	DMS214
Course title	Random Processes
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Academic
Field of study	Mathematics and Statistics
Responsible instructor	Kārlis Šadurskis
Academic staff	Nataļja Budkina Aija Pola Andrejs Matvejevs Oksana Pavļenko Marija Dobkeviča Jolanta Goldšteine
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN
Annotation	Definition and application of random process. Multivariate distributions. Correlation theory. Classification of processes. Stationary processes. Markov chain with discrete and continuous time. Markov processes. Gussian processes. Imitation of random processes.
Goals and objectives of the course in terms of competences and skills	Objective of the course is to acquaint students with basics of random processes theory and its mathematical apparatus, assiduity to Markov chains allow to understand the regularities of the random dynamic phenomena.
Structure and tasks of independent studies	The course provides the performance and defending of two individual independent hometasks
Recommended literature	1.V.Carkova, D.Kalniņa. Gadījuma procesi., Izd.LU, Rīga,1981. 2. Sh.Ross. Introduction to Probability Models. Fifth Eddition, Academic Press, NY,1995. 3.K.Šadurskis, V.Carkova. Markova procesi. Rīga, 2004g. 4.V.E. Gmurman. Varbūtību teorija un matemātiskā statistika. M; Visšaja škola,1977.
Course prerequisites	

Course outline

Theme	Hours
Definition of the random process. Multivariate distributions. Correlation function. Random processes in wide sense	2
Practical. Correlation theory elements.	2
Markov processes. Markov property. Transition probability functions.	2
Practical. Transition probability functions.	2
Classification of Markov processes. Discrete time Markov chains. Chapman - Kolmogorov equations.	2
Practical. Chapman - Kolmogorov equations.	2
Discrete time Markov chains. Classification of states of Markov chain. Recurrent and transient states.	2
Practical. Classification of states of Markov chain.	2
Discrete time Markov chains. Stationary distribution.	2
Practical. Discrete time Markov chains. Stationary distribution.	2
Continuous time Markov chains. Kolmogorov differential systems for transition and marginal probabilities..	2
Practical. Kolmogorov differential systems for transition and marginal probabilities..	2
Continuous time Markov chains. Stationary distribution.	2
Practical. Continuous time Markov chains. Stationary distribution.	2
Stationary distribution of queuing systems. Erlang formulas.	2
Practical. Erlang formulas.	2

Learning outcomes and assessment

Learning outcomes	Assessment methods
Discrete time Markov chains. Ability to construct transition probability matrix and apply it for calculation of characteristics of the chain, to find stationary distribution both theoretically and with immitation model.	Problems included in homework 1
Continuous time Markov chains. Ability to construct transition density matrix and apply it for calculation of characteristics of the chain, to find stationary distribution both theoretically and with immitation model.	Problems included in homework 2
Random processes' correlation theory. Markov processes. The major know-how for analysis of Markov chains.	Problems included in the exam

Study subject structure

Part	CP	Hours per Week			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	2.0	1.0	1.0	0.0		*	