RTU Course "Probability Theory and Mathematical Statistics"

12502 Varbūtību teorijas un mat. statistikas katedra

General data

Code	DMS212
Course title	Probability Theory and Mathematical Statistics
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	Carkovs Jevgenijs
Academic staff	Šadurskis Kārlis Matvejevs Andrejs Budkina Nataļja Pavļenko Oksana Pola Aija Buiķis Māris Dobkeviča Marija Pūre Daina Buža Vaira
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN
Possibility of distance learning	Not planned
Abstract	Classical definition of probability. Axiomatic definition of probability. Algebra of events. Bernully's scheme. Formulas of complete probability and Baijes. Continuous and discrete random variable. Distributive and density of functions. Large numbers law. Central limit theoreme. Elements of mathematical statistics. Combinatoric. Test of hypothesis.
Goals and objectives of the course in terms of competences and skills	The objective of the course is to acquaint students with basics of probability theory and its mathematical apparatus both on the classical scheme level, and also on axiomatic level. Allow to understand the regularities of the random phenomena that occur mass-repeating. Giving an overview of mathematical statistics mission and the possibility of using probability theory apparatus to solve them.
Structure and tasks of independent studies	The course provides an independent homework performance for each topic considered in practical work.
Recommended literature	1.O.Krastiņš. Varbūtību teorija un matemātiskā statistika. R:Zvaigzne,1985. 2.M.Buiķis,J.Carkovs,B.Siliņa. Varbūtību teorija un matemātiskās statistikas elementi.-Zvaigzne, 1996.
Course prerequisites	Linear algebra and analytic geometry, calculus.

Course outline

Theme	Hours
Definition of probability, sample space, events, algebra, probability axioms	2
Practical. Set operations with events	2
Classical definition, combinatorics, conditional probability, total probability and Bayes' formula	2
Practical. Classical scheme, conditional probability, total probability and Bayes' formula	2
Geometric probability, Bernoulli scheme, limit theorems for Bernoulli scheme.	2
Practical. Bernoulli scheme.	2
Random variables, distribution function, discrete and continuous distributions, probability density function.	2
Test. Random events.	2
Multivariate random variables, expectation, variance, properties	2
Practical. Distribution and probability density function.	2
Covariance, correlation coefficient, limit theorems, the law of great numbers, central limit theorem.	2
Practical. Expectation, variance.	2
Elements and principal problems of mathematical statistics. Data visualisation. Statistical estimates.	2
Practical. Multivariate random variables, covariance, correlation coefficient.	2
Testing hypotheses, losses, risk, Neyman-Pearson lemma, Bayesian an minimax criteria	2
Test. Random variables.	2

Learning outcomes and assessment

Learning outcomes	Assessment methods
Calculation of probabilities for random events. Application of probability axioms, classical definition, conditional probability, total probability and Bayes' and Bernoulli formulae	Problems to be solved included in test 1

Random variables. Application of major facts on probability distributions (discrete and continuous), distribution function, density, numeric characteristics.	Problems to be solved included in test 2
Elements of mathematical statistics. Application of statistical estimates and confidence intervals, major methods, hypotheses testing, losses, risk, form of criteria based on Neyman - Pearson lemma, characteristics of criteria.	Problems to be solved included in the exam

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	2.0	3.0	1.0	1.0	0.0		*	