



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
Predmet:	Verjetnost					
Course title:	Probability					
Študijski program in stopnja Study programme and level	Študijska smer Study field			Letnik Academic year	Semester Semester	
Matematika				3.	5.	
Mathematics				3 rd	5 th	
Vrsta predmeta / Course type				obvezni/compulsory		
Univerzitetna koda predmeta / University course code:						
Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
60		45			135	8
Nosilec predmeta / Lecturer:		Dominik BENKOVIČ				
Jeziki / Languages:	Predavanja / Lectures:		SLOVENSKO/SLOVENE			
	Vaje / Tutorial:		SLOVENSKO/SLOVENE			
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:				Prerequisites:		
Jih ni.				There are none.		
Vsebina:				Content (Syllabus outline):		
<ul style="list-style-type: none">Osnovni pojmi verjetnosti: Poskus, dogodek in algebra dogodkov. Klasična, statistična, geometrijska in aksiomatična definicija verjetnosti. Osnovne lastnosti verjetnosti.Pogojna verjetnost: Neodvisni dogodki. Relejni poskusi, formula za popolno verjetnost in Bayesova formula.Zaporedja neodvisnih poskusov: Bernoullijevo zaporedje poskusov. Binomska porazdelitev. Limitni izreki:				<ul style="list-style-type: none">Basic concepts of probability: experiment, event and sample space. The classical, statistical, geometrical and axiomatic definition of probability. Basic properties of probability.Conditional probability: Independent events. The formula of total probability and the Bayes' rule.Sequences of independent trials: Bernoulli trials. The binomial distribution. Limit theorems: Poisson's theorem, local and		

<p>Poissonova formula, Laplaceova lokalna in integralska formula. Bernoullijev zakon velikih števil.</p> <ul style="list-style-type: none"> • Slučajne spremenljivke: Porazdelitvena funkcija in njene osnovne lastnosti. Diskretne in zvezne porazdelitve. Pomembne porazdelitve. Funkcije slučajnih spremenljivk. • Številске karakteristike slučajnih spremenljivk: Matematično upanje in disperzija. Višji momenti in vrstilne karakteristike. • Slučajni vektorji. Diskretni in zvezni slučajni vektorji. Neodvisnost slučajnih spremenljivk. Funkcije slučajnih vektorjev. Kovarianca in korelacijski koeficient. • Rodovne in karakteristične funkcije: Definicija in osnovne lastnosti rodovnih in karakterističnih funkcij. • Limitni izreki teorije verjetnosti: Zakon velikih števil. Centralni limitni izrek. • Uvod v teorijo slučajnih procesov: Markovske verige. Klasifikacija stanj. Stacionarna porazdelitev. Primeri: slučajni sprehod, proces razvejanja, proces rojevanja, Poissonov proces. 	<p>integral Laplace theorems. The Bernoulli's law of large numbers.</p> <ul style="list-style-type: none"> • Random variables: The distribution function and its basic properties. Discrete and continuous distributions. Examples of most important distributions. Functions of random variables. • Numerical characteristics of random variables: Mathematical expectation and variance. Higher moments and order characteristics. • Random vectors: Discrete and continuous random vectors. Independence of random variables. Functions of random vectors. Covariance and correlation coefficient. • Generating and characteristic functions: Definition and elementary properties of generating and characteristic functions. • Limit theorems of probability theory: Law of large numbers. The central limit theorem. • Introduction to random processes: Markov chains. Classification of states. Stationary distribution. Examples: random walk, branching process, birth process, Poisson process.
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Temeljni literatura in viri / Readings:

1. R. Drnovšek, T. Košir, E. Kramar, G. Lešnjak: *Zbirka rešenih nalog iz verjetnostnega računa*, DMFA, 1998.
2. B. V. Gnedenko: *The theory of probability*, Mir Publishers, 1988.
3. G. R. Grimmett, D. R. Stirzaker: *Probability and random processes*, Oxford University Press, 1992.
4. M. Hladnik: *Verjetnost in statistika*, Fakulteta za računalništvo in informatiko 2002.
5. R. Jamnik: *Verjetnostni račun*, DMFA, 1987.
6. R. Jamnik: *Verjetnostni račun in statistika*, DMFA, 1995.
7. N. Sarapa: *Teorija vjerojatnosti*, Školska knjiga, 2002.

Cilji in kompetence:

Glavni cilj predmeta je proučiti najpomembnejše koncepte in rezultate teorije verjetnosti.

Objectives and competences:

The main goal of the course is to study the fundamental concepts and results of probability theory.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Razumevanje verjetnosti in različnih pristopov k definiranju le-te ter osvojitve različnih tehnik računanja verjetnosti.
- Osvojiti najpreprostejši primer slučajnega procesa - homogene markovske verige.
- Razumevanje in poznavanje osnovnih rezultatov teorije verjetnosti, ki so povezani s slučajnimi spremenljivkami in vektorji.
- Poznavanje osnovnih rezultatov, ki so povezani z rodovnimi in karakterističnimi funkcijami ter limitnimi izreki.

Prenosljive/ključne spretnosti in drugi atributi:

- Uporaba znanja iz teorije verjetnosti pri statistiki in na drugih področjih uporabne matematike.

Intended learning outcomes:

Knowledge and Understanding:

- Understanding the notion of probability, different approaches to its definition, and techniques of calculating probability.
- Understanding of the simplest example of the random process – Markov chain.
- Understanding and knowledge of basic results of the probability theory which are related to random variables and vectors.
- Knowledge of basic results which are related to generating and characteristic functions and also to limit theorems.

Transferable/Key Skills and other attributes:

- Knowledge transfer of methods of probability theory into statistics and to other fields of applied mathematics.

Metode poučevanja in učenja:

- Predavanja
- Teoretične vaje

Learning and teaching methods:

- Lectures
- Theoretical exercises

Načini ocenjevanja:**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge)

Izpit:

Pisni izpit – problemi
Ustni izpit – teorija

Pisni izpit – problemi se lahko nadomesti z dvema testoma (sprotni obveznosti).

Delež (v %) /
Weight (in %)

50%
50%

Type (examination, oral, coursework):

Exams:

Written exam – problems
Oral exam – theory

Written exam – problems can be replaced with two mid-term tests.

Each of the mentioned commitments must be assessed with a passing grade.

Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.

Opravljen pisni izpit – problemi je pogoj za pristop k ustnemu izpitu – teorija.

Passing grade of written exam – problems is required to take the oral exam – theory.

Reference nosilca / Lecturer's references:

1. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Generalized skew derivations on triangular algebras determined by action on zero products. *Communications in algebra*, ISSN 0092-7872, 2018, vol. 46, iss. 5, str. 1859-1867. <https://doi.org/10.1080/00927872.2017.1360334>.
2. BENKOVIČ, Dominik. Generalized Lie derivations of unital algebras with idempotents. *Operators and matrices*, ISSN 1846-3886, 2018, vol. 12, no. 2, str. 357-367. <https://doi.org/10.7153/oam-2018-12-23>.
3. BENKOVIČ, Dominik. Jordan σ -derivations of triangular algebras. *Linear and Multilinear Algebra*, ISSN 0308-1087, 2016, vol. 64, no. 2, str. 143-155. <http://dx.doi.org/10.1080/03081087.2015.1027646>.
4. BENKOVIČ, Dominik. A note on f -derivations of triangular algebras. *Aequationes mathematicae*, ISSN 0001-9054, 2015, vol. 89, iss. 4, str. 1207-1211. <http://dx.doi.org/10.1007/s00010-014-0298-y>.
5. BENKOVIČ, Dominik. Lie triple derivations of unital algebras with idempotents. *Linear and Multilinear Algebra*, ISSN 0308-1087, 2015, vol. 63, no. 1, str. 141-165. <http://dx.doi.org/10.1080/03081087.2013.851200>.