



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Kombinatorika in verjetnost
Course title:	Combinatorics and probability

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Izobraževalna matematika – dvopredmetni, 1. stopnja		2.	4.
Educational mathematics – Double- major, 1 st degree		2.	4.

Vrsta predmeta / Course type:

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
30		30			60	4

Nosilec predmeta / Lecturer:

Jeziki / Predavanja / Lectures:
Languages: Vaje / Tutorial:

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Jih ni.

Prerequisites:

There are none.

Vsebina:

- Kombinatorično preštevanje: Osnovna pravila preštevanja. Urejene in neurejene izbire, permutacije, variacije.
- Binomska in multinomska števila. Pravilo vključitev in izključitev. Linearna rekurzija.
- Osnovni pojmi verjetnosti: Poskus, dogodek in algebra dogodkov. Klasična, statistična, geometrijska in aksiomatična definicija verjetnosti. Osnovne lastnosti verjetnosti. Pogojna verjetnost. Formula popolne verjetnosti in Bayesov obrazec. Zaporedja neodvisnih poskusov.
- Naključne spremenljivke: Porazdelitvena funkcija in njene osnovne lastnosti. Pomembne diskretne in zvezne porazdelitve. Številске karakteristike naključnih spremenljivk.

Content (Syllabus outline):

- Combinatorial counting: Basic counting rules. Ordered and unordered selections, permutations.
- Binomial and multinomial numbers. Inclusion-exclusion principle. Linear recursion.
- Basic concepts of probability: experiment, event and sample space. The classical, statistical, geometrical and axiomatic definition of probability. Basic properties of probability. Conditional probability. The formula of total probability and the Bayes rule. Sequences of independent trials.
- Random variables: The distribution function and its basic properties. Examples of most important discrete and continuous distributions. Numerical characteristics of random variables.

Temeljni literatura in viri / Readings:

1. M. Hladnik: *Verjetnost in statistika*, Fakulteta za računalništvo in informatiko 2002.
2. R. Jamnik: *Verjetnostni račun in statistika*, DMFA, 1995.
3. M. Juvan, P. Potočnik, *Teorija grafov in kombinatorika*, DMFA, Ljubljana, 2000.
4. S. Klavžar, P. Žigert, *Izbrana poglavja uporabne matematike*, Pedagoška fakulteta, Maribor, 2002.
5. D. Veljan, *Kombinatorna i diskretna matematika*, Algoritam, Zagreb, 2001.

Cilji in kompetence:

Glavni cilj predmeta je proučiti osnovne koncepte in rezultate kombinatorike in teorije verjetnosti.

Objectives and competences:

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

Predvideni študijski rezultati:

Znanje in razumevanje:

- Razumevanje zahtevnejših principov diskretne matematike.
- Prepoznati praktične probleme in njihovo modeliranje z orodji diskretne matematike
- Razumevanje verjetnosti in različnih pristopov k definiranju le-te ter osvojitve različnih tehnik računanja verjetnosti.
- Razumevanje in poznavanje osnovnih rezultatov teorije verjetnosti, ki so povezani z naključnimi spremenljivkami.

Prenesljive/ključne spretnosti in drugi atributi:

Uporaba znanja iz kombinatorike in verjetnosti pri statistiki in na drugih področjih (računalništvo, kemija, biologija, optimizacija, ...)

Intended learning outcomes:

Knowledge and Understanding:

- Be able to understand more demanding principals of discrete mathematics.
- To recognize practical problems and their modeling with discrete mathematics tools.
- Understanding the notion of probability, different approaches to its definition, and techniques of calculating probability.
- Understanding and knowledge of basic results of the probability theory which are related to random variables

Transferable/Key Skills and other attributes:

Knowledge transfer of methods of combinatorics and probability into statistics and to other fields (computer science, chemistry, biology, optimization, ...)

Metode poučevanja in učenja:

- Predavanja
- Teoretične vaje
- Individualno delo

Learning and teaching methods:

- Lectures
- Theoretical exercises
- Individual work

Načini ocenjevanja:**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge)

Delež (v %) /
Weight (in %)

Type (examination, oral, coursework):

Izpit:

Pisni izpit – problemi

50%

Exams:

Written exam – problems

Ustni izpit – teorija

50%

Oral exam – theory

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

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

Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.

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

Opravljeno 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:		
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1. BENKOVIČ, Dominik, EREMITA, Daniel. Multiplicative Lie n-derivations of triangular rings. *Linear algebra appl.* [Print ed.], 2012, vol. 436, iss 11, str. 4223-4240. <http://dx.doi.org/10.1016/j.laa.2012.01.022>. [COBISS.SI-ID 16278361]
2. BENKOVIČ, Dominik. Lie triple derivations on triangular matrices. *Algebra colloq.*, 2011, vol. 18, spec. iss. 1, str. 819-826. <http://www.worldscinet.com/ac/18/preserved-docs/18spec01/S1005386711000708.pdf>. [COBISS.SI-ID 16204377]
3. LI, Yanbo, BENKOVIČ, Dominik. Jordan generalized derivations on triangular algebras. *Linear multilinear algebra*, 2011, vol. 59, no. 8, str. 841-849. <http://dx.doi.org/10.1080/03081087.2010.507600>. [COBISS.SI-ID 16006233]
4. BENKOVIČ, Dominik. Generalized Lie derivations on triangular algebras. *Linear algebra appl.* [Print ed.], 2011, vol. 434, iss 6, str. 1532-1544. [COBISS.SI-ID 15863897]
5. BENKOVIČ, Dominik. Biderivations of triangular algebras. *Linear algebra appl.* [Print ed.], 2009, vol. 431, iss. 9, str. 1587-1602. <http://dx.doi.org/10.1016/j.laa.2009.05.029>. [COBISS.SI-ID 15259481]