



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	<b>Kombinatorika in verjetnost</b>
<b>Course title:</b>	<b>Combinatorics and Probability</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj	/	2.	4.
Five-year master's degree program Subject Teacher	/		

**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			90	5

**Nosilec predmeta / Lecturer:**

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

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

**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:**

- D. Benkovič: Verjetnost, Univerza v Mariboru, Univerzitetna založba, 2022
- A. Cedilnik: Uvod v verjetnostni račun, Fakulteta za družbene vede, 2003.
- M. Hladnik: Verjetnost in statistika, Fakulteta za računalništvo in informatiko, 2002.
- R. Jamnik: Verjetnostni račun in statistika, DMFA, 1995.
- M. Konvalinka, P. Potočnik: Diskretna matematika I, Fakulteta za matematiko in fiziko, Ljubljana, 2019.
- M. Juvan, P. Potočnik, Teorija grafov in kombinatorika: primeri in rešene naloge, DMFA, Ljubljana, 2007.
- S. Klavžar, P. Žigert, Izbrana poglavja uporabne matematike, Pedagoška fakulteta, Maribor, 2002.

**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

**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.

<ul style="list-style-type: none"> <li>• Razumevanje verjetnosti in različnih pristopov k definiranju le-te ter osvojitve različnih tehnik računanja verjetnosti</li> <li>• Razumevanje in poznavanje osnovnih rezultatov teorije verjetnosti, ki so povezani z naključnimi spremenljivkami.</li> </ul> <p>Prenesljive/ključne spretnosti in drugi atributi:</p> <p>Uporaba znanja iz kombinatorike in verjetnosti pri statistiki in na drugih področjih.</p>	<ul style="list-style-type: none"> <li>• Understanding the notion of probability, different approaches to its definition, and techniques of calculating probability.</li> <li>• Understanding and knowledge of basic results of the probability theory which are related to random variables</li> </ul> <p>Transferable/Key Skills and other attributes:</p> <p>Knowledge transfer of methods of combinatorics and probability into statistics and to other fields.</p>
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#### Metode poučevanja in učenja:

<p>Predavanja Teoretične vaje Individualno delo</p>
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#### Learning and teaching methods:

<p>Lectures Theoretical exercises Individual work</p>
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Delež (v %) /

Weight (in %)

#### Načini ocenjevanja:

#### Assessment:

<u>Izpit:</u>		<u>Exams:</u>
<p>Pisni izpit – problemi Ustni izpit – teorija</p>	<p><b>50%</b> <b>50%</b></p>	<p>Written exam – problems Oral exam – theory</p>
<p>Pisni izpit – problemi se lahko nadomesti z dvema testoma (sprotne obveznosti).</p>		<p>Written exam – problems can be replaced with two mid-term tests.</p>
<p>Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.</p>		<p>Each of the mentioned commitments must be assessed with a passing grade.</p>
<p>Opravljen pisni izpit – problemi je pogoj za pristop k ustnemu izpitu – teorija.</p>		<p>Passing grade of written exam – problems is required to take the oral exam – theory.</p>

#### Reference nosilca / Lecturer's references:

1. BENKOVIČ, Dominik. Lie  $\sigma$ -derivations of triangular algebras. *Linear and Multilinear Algebra*. 2022, vol. 70, iss. 15, str. 2966-2983. ISSN 0308-1087. <https://www.tandfonline.com/doi/full/10.1080/03081087.2020.1820431>, DOI: [10.1080/03081087.2020.1820431](https://doi.org/10.1080/03081087.2020.1820431). [COBISS.SI-ID [127110659](https://www.cobiss.si/id/127110659)], [JCR]
2. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Jordan  $\{g, h\}$ -derivations of unital algebras. *Operators and matrices*. 2022, vol. 16, no. 2, str. 415-428. ISSN 1846-3886. <http://oam.ele-math.com/16-32/Jordan-g,h-derivations-of-unital-algebras>, DOI: [10.7153/oam-2022-16-32](https://doi.org/10.7153/oam-2022-16-32). [COBISS.SI-ID [114972163](https://www.cobiss.si/id/114972163)], [JCR]
3. BENKOVIČ, Dominik. Generalized Lie  $\eta$ -derivations of triangular algebras. *Communications in algebra*. 2019, vol. 47, iss. 12, str. 5294-5302. ISSN 0092-7872. <https://doi.org/10.1080/00927872.2019.1617875>, DOI: [10.1080/00927872.2019.1617875](https://doi.org/10.1080/00927872.2019.1617875). [COBISS.SI-ID [18879833](https://www.cobiss.si/id/18879833)], [JCR]

4. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Generalized skew derivations on triangular algebras determined by action on zero products. *Communications in algebra*. 2018, vol. 46, iss. 5, str. 1859-1867. ISSN 0092-7872. <https://doi.org/10.1080/00927872.2017.1360334>, DOI: [10.1080/00927872.2017.1360334](https://doi.org/10.1080/00927872.2017.1360334). [COBISS.SI-ID [18505817](https://doi.org/10.1080/00927872.2017.1360334)], [JCR]
5. BENKOVIČ, Dominik. Generalized Lie derivations of unital algebras with idempotents. *Operators and matrices*. 2018, vol. 12, no. 2, str. 357-367. ISSN 1846-3886. <https://doi.org/10.7153/oam-2018-12-23>, DOI: [10.7153/oam-2018-12-23](https://doi.org/10.7153/oam-2018-12-23). [COBISS.SI-ID [18506073](https://doi.org/10.7153/oam-2018-12-23)], [JCR]