



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

|                      |                                   |
|----------------------|-----------------------------------|
| <b>Predmet:</b>      | <b>Statistika v izobraževanju</b> |
| <b>Course title:</b> | <b>Statistics in Education</b>    |

| Študijski program in stopnja<br>Study programme and level              | Študijska smer<br>Study field | Letnik<br>Academic year | Semester<br>Semester |
|------------------------------------------------------------------------|-------------------------------|-------------------------|----------------------|
| Enovit magistrski študijski program<br>druge stopnje Predmetni učitelj | /                             | 3.                      | 5.                   |
| Five-year master's degree program<br>Subject Teacher                   | /                             |                         |                      |

**Vrsta predmeta / Course type**

Obvezni / Compulsory

**Univerzitetna koda predmeta / University course code:**

| Predavanja<br>Lectures | Seminar<br>Seminar | Sem. vaje<br>Tutorial | Lab. vaje<br>Laboratory work | Teren. vaje<br>Field work | Samost. delo<br>Individ. work | ECTS |
|------------------------|--------------------|-----------------------|------------------------------|---------------------------|-------------------------------|------|
| 30                     |                    |                       | 15                           |                           | 45                            | 3    |

**Nosilec predmeta / Lecturer:**

Niko TRATNIK

**Jeziki /**

**Predavanja / Lectures:**

slovenski / Slovenian

**Languages:**

**Vaje / Tutorial:**

slovenski / Slovenian

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

Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno.

**Prerequisites:**

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

**Vsebina:**

- Osnovni pojmi statistike: Statistična populacija in vzorec. Klasifikacija statističnih spremenljivk. Urejanje statističnih podatkov. Grafični in tabelarni prikazi statističnih podatkov.
- Opisna statistika. Populacijske in vzorčne mere osrednje tendence in njihove karakteristike. Vrstilne karakteristike. Mere razpršenosti.
- Korelacija in regresija: Povezanost statističnih spremenljivk. Mere korelacije in korelacijski koeficienti. Pogojno matematično upanje. Regresijska premica. Metoda najmanjših kvadratov. Pojasnjena in nepojasnjena varianca.
- Vzorčne porazdelitve: Osnovni izrek matematične statistike. Porazdelitveni zakoni pomembnih vzorčnih statistik.
- Ocenjevanje parametrov: Točkovne in intervalne ocene. Cenilke in njihove lastnosti. Interval zaupanja.
- Preskušanje statističnih hipotez: Ničelna in alternativna hipoteza. Testna statistika in njeno kritično območje.
  - Parametrični preizkusi značilnosti.
  - Neparametrični preizkusi značilnosti.
  - Testiranje neodvisnosti.

**Content (Syllabus outline):**

- Basic concepts of statistics: Statistical population and sample. Classification of statistical variables. Ordering statistical data. Graphical and tabular presentation of statistical data.
- Descriptive statistics: Population and sample measures of central tendency and their characteristics. Order statistics. Measures of variability.
- Correlation and regression. Relationships between statistical variables. Measures of correlation and correlation coefficients. Conditional mathematical expectation. The regression line. Method of least squares. Explained and unexplained variance.
- Sampling Distributions: The basic theorem of mathematical statistics. Distribution functions of some important sampling statistics.
- Estimation of parameters: Point estimations and confidence intervals. Estimators and their properties. Confidence interval.
- Testing statistical hypothesis: Null hypothesis and alternative hypotheses. Test statistics and its critical region.
  - Parameters hypotheses testing.
  - Nonparameters hypotheses testing.
  - Testing the independence.

**Temeljni literatura in viri / Readings:**

1. A. P. Field, *Discovering statistics using IBM SPSS statistics*. London: Sage, 2018.
2. R. Jamnik, *Matematična statistika*. Ljubljana: DZS, 1980.
3. R. Jamnik, *Verjetnostni račun in statistika*. Ljubljana: DMFA, 1995.
4. B. Kožuh, J. Vogrinc, *Obdelava podatkov*. Ljubljana: Znanstvena založba Filozofske fakultete, 2011.
5. J. Sagadin, *Statistične metode za pedagogoe*. Maribor: Obzorja, 2003.

**Dodatna literatura / Additional Readings:**

1. M. Hladnik, *Verjetnost in statistika: zapiski predavanj*. Ljubljana: Fakulteta za računalništvo in informatiko, 2002.

**Cilji in kompetence:**

Glavni cilj predmeta je proučiti najpomembnejše koncepte, metode in rezultate statistike.

**Objectives and competences:**

The main goal of the course is to study the fundamental concepts, methods and results of statistics.

**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Znanje in razumevanje:</b> <ul style="list-style-type: none"> <li>• Razumevanje in poznavanje osnovnih pojmov in klasičnih metod statistične analize podatkov.</li> <li>• Razumevanje in pravilna uporaba različnih statističnih testov.</li> <li>• Obvladanje ustrezne programske opreme za namene statističnega raziskovanja.</li> </ul> | <b>Knowledge and understanding:</b> <ul style="list-style-type: none"> <li>• Understanding and knowledge of the basic concepts and classical methods of statistical data analysis.</li> <li>• Understanding and correct application of different statistical tests.</li> <li>• Knowledge of using appropriate software for statistical research.</li> </ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                                                                                |                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Metode poučevanja in učenja:</b> <ul style="list-style-type: none"> <li>• Predavanja</li> <li>• Laboratorijske vaje</li> <li>• Individualno delo</li> </ul> | <b>Learning and teaching methods:</b> <ul style="list-style-type: none"> <li>• Lectures</li> <li>• Laboratory exercises</li> <li>• Individual work</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Delež (v %) /<br>Weight (in %) |     | Assessment:      |
|--------------------------------|-----|------------------|
| Načini ocenjevanja:            |     |                  |
| Pisni izpit                    |     | Written exam     |
| Teoretični izpit               |     | Theoretical exam |
|                                | 50% |                  |
|                                | 50% |                  |

#### Opombe:

Pisni izpit se lahko nadomesti s kolokviji v enakem deležu 50%.

Teoretični izpit se lahko nadomesti s kolokviji v enakem deležu 50%.

#### Comments:

Written exam can be replaced by written midterm exams in the weight of 50%.

Theoretical exam can be replaced by midterm exams in the weight of 50%.

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

1. BREZOVNIK, Simon, CHE, Zhongyuan, TRATNIK, Niko, ŽIGERT PLETERŠEK, Petra. Resonance graphs of plane bipartite graphs as daisy cubes. *Discrete applied mathematics*. May 2025, vol. 366, str. 75-85. ISSN 0166-218X. <https://www.sciencedirect.com/science/article/pii/S0166218X25000228>, DOI: 10.1016/j.dam.2025.01.017. [COBISS.SI-ID 224635651]
2. BREZOVNIK, Simon, CHE, Zhongyuan, TRATNIK, Niko, ŽIGERT PLETERŠEK, Petra. Outerplane bipartite graphs with isomorphic resonance graphs. *Discrete applied mathematics*. Jan. 2024, vol. 343, str. 340-349. ISSN 0166-218X. <https://www.sciencedirect.com/science/article/pii/S0166218X23004195>, DOI: 10.1016/j.dam.2023.11.006. [COBISS.SI-ID 172545795]
3. TRATNIK, Niko. Zhang-Zhang polynomials of phenylenes and benzenoid graphs. *MATCH Communications in Mathematical and in Computer Chemistry*. 2024, vol. 92, no. 1, str. 25-53. ISSN 3009-4399. [https://match.pmf.kg.ac.rs/issues/m92n1/m92n1\\_25-53.html](https://match.pmf.kg.ac.rs/issues/m92n1/m92n1_25-53.html), DOI: 10.46793/match.92-1.025T. [COBISS.SI-ID 185502723]

4. BREZOVNIK, Simon, DEHMER, Matthias, TRATNIK, Niko, ŽIGERT PLETERŠEK, Petra. Szeged and Mostar root-indices of graphs. *Applied mathematics and computation*. Apr. 2023, vol. 442, [article no.] 127736, 11 str. ISSN 0096-3003. <https://www.sciencedirect.com/science/article/pii/S0096300322008049>, DOI: 10.1016/j.amc.2022.127736. [COBISS.SI-ID 139442179]
5. TRATNIK, Niko, YE, Dong. Resonance graphs on perfect matchings of graphs on surfaces. *Graphs and combinatorics*. 2023, vol. 39, iss. 4, [article no.] 68, 15 str. ISSN 0911-0119. <https://link.springer.com/article/10.1007/s00373-023-02666-4>, DOI: 10.1007/s00373-023-02666-4. [COBISS.SI-ID 155893507]