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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** |
| **Ime predmeta:** | STATISTIČNE METODE V LOGISTIKI |
| **Course title:** | STATISTICAL METHODS IN LOGISTICS |
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| **Študijski program in stopnja****Study programme and cycle** | **Študijska smer****Study option** | **Letnik****Year of study** | **Semester****Semester** |
| LOGISTIKA SISTEMOV 1. stopnja |  | 2. | 3 |
| SYSTEM LOGISTICS 1st degree |  | 2. |  3  |
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| **Vrsta predmeta (obvezni ali izbirni) /** **Course type (compulsory or elective)** | OBVEZNI |
| COMPULSORY |
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| **Univerzitetna koda predmeta / University course code:** | UN |
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| **Predavanja****Lectures** | **Seminar****Seminar** | **Vaje****Tutorial** | **Klinične vaje****Clinical training** | **Druge oblike študija****Other forms of study** | **Samost. delo****Individual work** |  | **ECTS** |
|  24 a-P  21 e-P |  | 9 e-V21 a-V |  |  | 105 |  | 6 |
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| **Nosilec predmeta / Course coordinator:** | **TOMAŽ KRAMBERGER** |
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| **Jeziki /Languages:** | **Predavanja / Lectures:** | SLOVENSKI/SLOVENE |
| **Vaje / Tutorial:** | SLOVENSKI/SLOVENE |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** |  | **Prerequisites for enrolling in the course or for performing study obligations:** |
| Ni pogojev. |  | None. |
| **Vsebina (kratek pregled učnega načrta):**  |  | **Content (syllabus outline):** |
| * Uvod. Osnovni pojmi statistike.
* Urejanje in prikazovanje statističnih podatkov.
* Relativna števila/statistične mere. Srednje vrednosti. Mere variabilnosti podatkov. Asimetrija in mere asimetrije. Sploščenost in mere sploščenosti. Mere koncentracije. Lorenzov grafikon.
* Časovne vrste, trend, določanje linearnega trenda, metoda najmanjših kvadratov.
* Slučajne spremenljivke. Porazdelitveni zakon. Porazdelitvena funkcija.
* Diskretne slučajne spremenljivke, zvezne slučajne spremenljivke.
* Posebne diskretne slučajne spremenljivke. Posebne zvezne slučajne spremenljivke.
* Funkcije slučajnih spremenljivk. Slučajni vzorci. Statistike.
* Aritmetična sredina vzorca, varianca vzorca, porazdelitev aritmetične sredine vzorca. Centralni limitni izrek.
* Statistično ocenjevanje. Cenilka. Ocenjevanje aritmetične sredine populacije.
* Testiranje hipotez. Pojem statistične hipoteze.
* Statistika testa hipoteze. Kritično območje testa. Postopek testiranja hipotez.
* Testiranje aritmetične sredine.
* Regresija. Enostavna normalna regresija. Enostranska, dvostranska odvisnost.
 |  | * Introduction. Basis of statistics.
* Editing and presenting statistical data.
* Relative numbers/statistical measures. Mean values. Measures of data variability. Asymmetry and asymmetry measures. Kurtosis and skewness. Concentration measures. Lorenz curve.
* Time series, trend, determining linear trend, least squares method.
* Random variables. Distribution law. Distribution function.
* Discrete random variables, continuous random variables.
* Special discrete random variables.
* Special continuous random variables.
* Functions of random variables. Random patterns. Statistics.
* Arithmetic mean of a sample, variance of a sample, distribution of the arithmetic mean of a sample. Central limit theorem.
* Statistical estimating. Estimator.
* Estimating the arithmetic mean of a population.
* Hypotheses testing. The term of statistical hypothesis. Hypothesis test statistics. Critical area of a test. Hypotheses testing process. Arithmetic media testing.
* Regression. Simple normal regression. One-tail and two-tail dependance.
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| **Temeljni literatura in viri / Reading materials:** |
| 1. KRAMBERGER, Tomaž. Osnove modeliranja u logistici. Subotica: [Ekonomski fakultet], 2015. 290 str., ilustr. ISBN 978-86-84819-98-9. [COBISS.SI-ID [512672317](https://plus.si.cobiss.net/opac7/bib/512672317?lang=sl)].
2. Kovač Striko, E., Fratrović, T., & Ivanković, B. (2008). Vjerojatnost i statistika: s primjerima iz tehnologije prometa (str. 207). Fakultet prometnih znanosti, Sveučilište u Zagrebu.
3. Schmuller, J. (2022). Statistical Analysis with Excel For Dummies (str. 576). For Dummies (Computer/Tech)).
4. Frost, J. (2020). Introduction to Statistics: An Intuitive Guide for Analyzing Data and Unlocking Discoveries (str. 255). Statistics By Jim Publishing.
5. Košmelj, K. (2007). Uporabna statistika (2. dopolnjena izd.). Biotehniška fakulteta. https://repozitorij.uni-lj.si/IzpisGradiva.php?id=17699
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| **Cilji in kompetence:** |  | **Objectives and competences:** |
| Študenti: * spoznajo pojme in metode matematične statistike ter teorije slučajnih procesov,
* osvojijo statistični pristop k preučevanju množičnih pojavov, predvsem pojavov vezanih na področje logistike,
* se naučijo uporabe statističnih metod v analizi logističnih procesov in logističnih sistemov.
 |  | Students:* understand concepts and methods of mathematical statistics and theory of random processes,
* acquire statistical approach to mass phenomena analysis, especially phenomena from the field of logistics,
* learn to apply statistical methods in analysis of logistics processes and logistics systems.
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| **Predvideni študijski rezultati:** |  | **Intended learning outcomes:** |
| Znanje in razumevanje: * študenti osvojijo osnovne pojme statistike,
* študenti osvojijo matematične osnove za statistično proučevanje pojavov v logističnih sistemih,
* študenti se naučijo uporabiti statistične metode za raziskovanje konkretnih logističnih problemov,
* študenti se naučijo razumevati in prepoznavati statistično-matematične povezave v logističnih sitemih,
* študenti se naučijo osnov linearnega modeliranja.

Prenesljive/ključne spretnosti in drugi atributi: Predmet se v splošnem navezuje na vse logistične predmete, saj se pri tem predmetu študentje naučijo statističnih metod in postopkov statističnega modeliranja.Študenti se usposobijo za uporabo teoretičnega znanja v praktičnih primerih, predvsem pri predmetih, vezanih na upravljanje, planiranje in vodenje v logistiki.  |  | Knowledge and understanding:* students are familiarised with basic terminology of statistics,
* students are familiarised with mathematical basics for statistical analysis of phenomena in logistics systems,
* students learn to apply statistical methods in analysis of concrete logistical problems,
* students learn to understand and recognise statistical-mathematical interconnection in logistics systems,
* students learn basis of linear modelling.

Transferable/key skills and other attributes:The subject generally relates to all logistics subjects, as is in this one students learn statistical methods and statistical modelling procedures. Students gain the ability to apply theoretical knowledge in practical examples, especially in courses, related to management and planning in logistics.  |
| **Metode poučevanja in učenja:** |  | **Learning and teaching methods:** |
| Predavanja: pri predavanjih študent spozna teoretične vsebine predmeta (uporabljene metode razlage, prikazovanja in razgovora). Del predavanj se izvaja na klasični način v predavalnici, del pa v obliki e-predavanj (e-predavanja se lahko izvajajo na videokonferenčni način ali s pomočjo posebej v ta namen didaktično pripravljenih e-gradiv v virtualnem elektronskem učnem okolju). ). V okviru e-predavanj se študenti soočijo tudi s samostojnim in problemskim učenjem, kjer rešujejo odprte probleme ter izvajajo pregled in obdelavo podatkov iz statističnih baz (SiStat in Eurostat).Vaje: pri vajah študent utrdi teoretično znanje in spozna aplikativne možnosti. Del vaj se izvaja na klasični način v predavalnici, del pa v obliki e-vaj (e-vaje se lahko izvajajo na videokonferenčni način ali s pomočjo posebej v ta namen didaktično pripravljenih e-gradiv v virtualnem elektronskem učnem okolju). Poleg že navedenih metod, se študentje poslužijo še raziskovalne metode in metode učenja skozi prakso. |  | Lectures: students understand the theoretical frameworks of the course (used methods of explanation, demonstration and conversation). Part of the lecture course is in a classroom while the rest is in the form of e-learning (e-lectures may be given via video-conferencing or with the help of specially designed e-material in a virtual electronic learning environment). At e-lectures students are also faced with independent and problem-based learning, where they solve open problems and perform the review and processing of data from statistical databases (SiStat and Eurostat).Tutorials: Students enhance their theoretical knowledge and are able to apply it. Part of the tutorial is in a classroom while the rest is in the form of e-tutorials (e-tutorials may be given via video-conferencing or with the help of specially designed e-material in a virtual electronic learning environment). Besides the aforementioned methods, students also use research metod and method of learning by doing. |
| **Načini ocenjevanja:** | Delež (v %) /Share (in %) | **Assessment methods:** |
| * e-predavanja in e-vaje
* Pisni izpit.
 | 20%80% | * e-lectures and e-tutorials
* Written exam.
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| **Reference nosilca / Course coordinator's references:**  |
| 1. KRAMBERGER, Tomaž, ŽEROVNIK, Janez. Priority constrained Chinese postman problem. *Logistics and sustainable transport*, 22-05-07, vol. 1, no 1, 15 str. <http://www.jlst.org/uploads/priority_constrained_chinese_postman_kramb.zer.pdf>. 2. KRAMBERGER, Tomaž, ROSI, Bojan. Do managers have enough quality information for decision-making. *Organizacija (Kranj)*, sep.-okt. 2007, letn. 40, št. 5, str. 207-217. 3. KRAMBERGER, Tomaž, ŽEROVNIK, Janez. A contribution to environmentally friendly winter road maintenance: : optimizing road de-icing. *Transp. res., Part D Transp. environ.*. [Print ed.], July 2008, vol. 13, iss. 5, str. 340-346. <http://dx.doi.org/10.1016/j.trd.2008.03.007>, doi: [10.1016/j.trd.2008.03.007](http://dx.doi.org/10.1016/j.trd.2008.03.007). 4. KRAMBERGER, Tomaž, ŠTRUBELJ, Gregor, ŽEROVNIK, Janez. Chinese postman problem with priority nodes. *Fund. Computing Decis. Sci.*, 2009, vol. 34, no. 4, str. 233-264. <http://fcds.cs.put.poznan.pl/FCDS2/ArticleDetails.aspx?articleId=218>. 5. FOŠNER, Maja, KRAMBERGER, Tomaž. Logistics as a part of leisure and tourism industry. V: 15th Annual Conference European Council for Business Education, May 28-30, 2010, Lausanne, Switzerland. *"Co-operation and competition - in the leisure and service industries" : proceedings of the 15th Annual Conference European Council for Business Education, May 28-30, 2010, Lausanne, Switzerland*, (ECBE proceedings of the Annual Conference, 2010). Lausanne: European Council for Business Education: = ECBE, 2010, str. 70-78. |