UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Ime predmeta:	STATISTIČNO MODELIRANJE V LOGISTIKI
Course title:	STATISTICAL MODELING IN LOGISTICS

Študijski program in stopnja Study programme and cycle	Študijska smer Study option	Letnik Year of study	Semester Semester
LOGISTIKA SISTEMOV 1. stopnja		2.	4.
SYSTEM LOGISTICS 1st degree		2.	4.

Vrsta predmeta (obvezni ali izbirni) / Course type (compulsory or elective)	OBVEZNI
	COMPULSORY

Univerzitetna koda predmeta / University course code: UN

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Clinical training	Druge oblike študija Other forms of study	Samost. delo Individual work	ECTS
24 e-P 21 a-P		9 e-V 21 a-V			105	6

Nosilec predmeta / Course coordinator:	TOMAŽ KRAMBERGER

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.	• 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

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.	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.

Temeljni literatura in viri / Reading materials:

E-gradivo predmeta.
Tominc, P.: Statistika v prometu, Univerza v Mariboru, Fakulteta za gradbeništvo, Maribor, 2000.
Spiegel, M.: Schaum's outline of theory and problems of statistics, London, McGraw-Hill International, 1992.
KRAMBERGER, Tomaž. Osnove modeliranja u logistici. Subotica: [Ekonomski fakultet], 2015. 290 str., ilustr. ISBN 978-86-84819-98-9. [COBISS.SI-ID 512672317].

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.

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.	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.
Prenesljive/ključne spretnosti in drugi atributi: Študenti se usposobijo za uporabo teoretičnega znanja v praktičnih primerih, predvsem pri	Transferable/key skills and other attributes: Students gain the ability to apply theoretical knowledge in practical examples, especially in

predmetih Upravljanje s človeškimi viri v logistiki in Projektni management v logistiki.	courses Human resource management and Management in logistics.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja: pri predavanjih študent spozna teoretične vsebine predmeta. 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). 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).	Lectures: students understand the theoretical frameworks of the course. 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). 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).

Načini ocenjevanja:	Delež (v %) / Share (in %)	**Assessment methods:**
• Opravljene obveznosti e-predavanj in e-vaj so pogoj za pristop k izpitu.		• Successful completion of e-lectures and e-tutorials is a prerequisite for entering the exam.
• Pisni izpit.	70%	• Written exam.
• Seminarska naloga.	30%	• Project work.

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.
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.