UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Ime predmeta:	UPORABA OPTIMIZACIJSKIH METOD V LOGISTIKI
Course title:	APPLICATION OF OPTIMIZATION TECHNIQUES IN LOGISTICS

Študijski program in stopnja **Study programme and cycle**	**Študijska smer** **Study option**	**Letnik** **Year of study**	**Semester** **Semester**
GOSPODARSKA IN TEHNIŠKA LOGISTIKA 1. stopnja		2.	4.
PROFESSIONAL HIGHER EDUCATION STUDY PROGRAMME ECONOMIC AND TECHNICAL LOGISTICS 1st degree		2.	4.

Vrsta predmeta (obvezni ali izbirni) / **Course type (compulsory or elective)**	OBVEZNI COMPULSORY
Univerzitetna koda predmeta / University course code:	VS

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**			**Klinične vaje** **Clinical training**	**Druge oblike študija** **Other forms of study**	**Samost. delo** **Individual work**	**ECTS**
30 e-P 30 a-P		**a-V**	**e-V**	**LV**			90	6
		6	12	12				

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):**
• Ponovitev osnov matričnega in procentnega računa, razmerja, razdelilni račun, zmesi račun. Osnove obrestnega računa, navadni obrestni račun, obrestno obrestni račun, vloge in dvigi, posojila. • Sistemi linearnih enačb in neenačb pri reševanju optimizacijskih problemov. • Konveksne množice pri reševanju optimizacijskih problemov. • Optimizacijski modeli. • Linearno programiranje (formulacija problema, reševanje na grafični način, reševanje s programskim paketom LINGO in Microsoft	• Revision of basics of matrix and interest calculations, ratios, distribution calculation, mixture calculation. Basics of interest calculation, ordinary interest calculation, interest rate calculation deposits and withdrawals, loans. • Systems of linear equations and inequalities in solving optimization problems. • Convex masses in solving optimization problems. • Optimization models. • Linear programming (problem formulation, solving problems using graphs, solving problems using LINGO and Microsoft Excel software).

Excel). • Osnove DEA (Data Envelopment Analysis) analize (analitični in grafični način reševanja).	• Basics of DEA (Data Envelopment Analysis) (using analitical and graphical methods).

Temeljni literatura in viri / Reading materials:

E-gradivo predmeta.
Kramberger, T. & Šinko, S. Linearno programiranje v logistiki. Fakulteta za logistiko, Celje, v tisku.
Winston, W. L.: Operations Research; Applications and algorithms. Thomson Learning, Belmont, CA, 4th ed.
Vadnal, A.: Linearno programiranje, Informator, Zagreb, 1977.
Waters. D.: Quantitative Methods for Business, Addison Wesley, Essex, 1997, ISBN: 0-201-403978,COBISS.SI-ID: 9076454.
Čižman, A.: Operacijske raziskave : teorija in uporaba v organizaciji, Kranj, Moderna organizacija, 2003,ISBN: 961-232-162-0, COBISS.SI-ID: 127813888.

Cilji in kompetence:	**Objectives and competences:**
Cilji predmeta so: • seznaniti študente z matričnim in procentnim račun, razmerji, razdelilnim računom, zmesnim računom, obrestnim računom, vlogami, dvigi in posojili. • seznaniti študente s sistemi linearnih enačb in neenačb z nami reševanja optimizacijskih problemov, • seznaniti študente s konveksnimi množicami in njihovo uporabo pri reševanju optimizacijskih problemov, • seznaniti študente z optimizacijskimi modeli, • seznaniti študente z linearnim programiranjem, • seznaniti študente z osnovami DEA analize. Kompetence, ki jih študentje osvojijo: • sposobnost uporabe matričnega in procentnega računa, razmerij, razdelilnega računa, zmesnega računa, obrestnega računa, vlog, dvigov in posojil za namene logističnih operacij, • sposobnost uporabe sistemov linearnih enačb in neenačb z namenom reševanja optimizacijskih problemov, • sposobnost uporabe konveksnih množic z namenom reševanja optimizacijskih problemov, • sposobnost zapisati realen problem z linearnim programom, grafično rešiti preprost primer linearnega programa, uporabiti programski paket LINGO in Microsoft Excel za reševanje linearnih programov, • sposobnost uporabe DEA analize za določanje učinkovitosti.	The objectives of the course are: • to acquaint students with matrix and percentage calculations, ratios, distribution calculations, joint calculations, interest calculations, deposits, withdrawals and loans. • to acquaint students with systems of linear equations and inequalities with us for solving optimization problems, • to acquaint students with convex sets and their use in solving optimization problems, • to acquaint students with optimization models, • to acquaint students with linear programming, • to acquaint students with the basics of DEA analysis. Competences that students acquire: • ability to use matrix and percentage calculations, ratios, distribution calculations, joint calculations, interest calculations, deposits, withdrawals and loans, • ability to use systems of linear equations and inequalities in order to solve optimization problems, • ability to use convex sets in order to solve optimization problems, • ability to write a real problem with a linear program, graphically solve a simple example of a linear program, use the software package LINGO and Microsoft Exccel to solve linear programs, • ability to use DEA analysis to determine performance.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent ob zaključku predmeta: • uporabi matrični in procentni račun, razmerja, razdelilni račun, zmesni račun, obrestni račun, vloge, dvige in posojila na realnih problemih, • razume kaj je optimizacijski model in pozna korake izvedbe optimizacije, • zapiše linearni program na osnovi podanega problema, • reši linearni program na grafični način in za reševanje uporabiti programski paket LINGO in Microsoft Excel • izvede preprosto DEA analizo za določanje učinkovitosti Prenesljive/ključne spretnosti in drugi atributi: Študenti se usposobijo za uporabo teoretičnega znanja v praktičnih primerih, predvsem pri procesih, ki so jih spoznali pri predmetih Osnove logistike, Osnove logističnih procesov in trajnostnih oskrbovalnih verig, Osnove ekonomike v logistiki v prvem letniku.	Student at the end of the course: • knows how to use matrix and percentage calculations, ratios, distribution calculations, joint calculations, interest calculations, deposits, withdrawals and loans, • understands what an optimization model is and knows the steps of performing optimization, • can write a linear program based on a given problem, • can solve a linear program in a graphical way and use the LINGO and Microsoft Excel software package for solving it • Performs a simple DEA analysis to determine performance Transferable/Key Skills and other attributes: Students learn to apply theoretical knowledge to practical situations, especially processes from the following subjects: Basics of logistics, Basics of logistics processes and sustainable supply chains, Fundamentals of Economics in logistics from year 1.

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 v okviru laboratorijskih vaj, 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 seminar is in a classroom while the rest is in the form of e-learning (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:**
Predavanja: Pisni izpit.	80%	**Lectures:** Written examination.

Vaje: Ocena e-vaj.	20%	**Tutorials:** Grade from e-tutorials.

Reference nosilca / Course coordinator's references:

1. KRAMBERGER, Tomaž, MONIOS, Jason, ŠTRUBELJ, Gregor, RUPNIK, Bojan. Using dry ports for port co-opetition : the case of Adriatic ports. *International journal of shipping and transport logistics*, ISSN 1756-6525. [Online ed.], 2018, vol. 10, iss. 1, str. 18-44, ilustr. http://www.inderscience.com/info/inarticle.php?artid=88319, doi: 10.1504/IJSTL.2018.10008533. [COBISS.SI-ID 512889661].
2. BUTTON, Kenneth John, KRAMBERGER, Tomaž, GROBIN, Klemen, ROSI, Bojan. A note on the effects of the number of low-cost airlines on small tourist airports' efficiencies. *Journal of Air Transport Management*, ISSN 1873-2089. [Online ed.], 2018, vol. 72, str. 92-97. https://www.sciencedirect.com/science/article/pii/S096969971730114X, doi: 10.1016/j.jairtraman.2017.12.003. [COBISS.SI-ID 512892733].
3. BUTTON, Kenneth John, KRAMBERGER, Tomaž, VIZINGER, Tea, INTIHAR, Marko. Economic implications for Adriatic seaport regions of further opening of the Northern Sea Route. *Maritime economics & logistics*, ISSN 1479-294X. [Spletna izd.], Mar. 2017, vol. 19, iss. 1, str. 52-67, ilustr. http://www.palgrave-journals.com/mel/journal/vaop/ncurrent/abs/mel201525a.html, doi: 10.1057/mel.2015.25. [COBISS.SI-ID 512702781].
4. INTIHAR, Marko, KRAMBERGER, Tomaž, DRAGAN, Dejan. Container throughput forecasting using dynamic factor analysis and ARIMAX model. *Promet*, ISSN 0353-5320. [Print ed.], 2017, vol. 29, no. 5, str. 529-542, ilustr. [COBISS.SI-ID 512879421].
5. KRAMBERGER, Tomaž, RUPNIK, Bojan, ŠTRUBELJ, Gregor, PRAH, Klemen. Port hinterland modelling based on port choice. *Promet*, ISSN 0353-5320. [Print ed.], 2015, vol. 27, no. 3, str. 195-203, ilustr. http://www.fpz.unizg.hr/traffic/index.php/PROMTT/article/view/1611, doi: 10.7307/ptt.v27i3.1611. [COBISS.SI-ID 512689725].