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):

- 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 Excel).

Content (syllabus outline):

- 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).
- Basics of DEA (Data Envelopment Analysis) (using analitical and graphical methods).

• Osnove DEA (Data Envelopment Analysis) analize (analitični in grafični način reševanja).	

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:

Cilji predmeta so:
• seznaniti študente z matričnim in procentnim računom, 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.

Objectives and competences:

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:

Študent ob zaključku predmeta:
• uporabi matrični in procentni račun, razmerja, razdelilni račun, zmesni račun, obrestni račun,

Intended learning outcomes:

Student at the end of the course:
• knows how to use matrix and percentage calculations, ratios, distribution calculations,

vloge, dvige in posojila na realnih problemih,	joint calculations, interest calculations, deposits, withdrawals and loans,
• razume kaj je optimizacijski model in pozna korake izvedbe optimizacije,	• understands what an optimization model is and knows the steps of performing optimization,
• zapiše linearni program na osnovi podanega problema,	• can write a linear program based on a given problem,
• reši linearni program na grafični način in za reševanje uporabiti programski paket LINGO in Microsoft Excel	• can solve a linear program in a graphical way and use the LINGO and Microsoft Excel software package for solving it
• izvede preprosto DEA analizo za določanje učinkovitosti	• Performs a simple DEA analysis to determine performance
Prenesljive/ključne spretnosti in drugi atributi:	Transferable/Key Skills and other attributes:
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.	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).	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).
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).	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].