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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** |
| **Ime predmeta:** | UPORABA OPTIMIZACIJSKIH METOD V LOGISTIKI |
| **Course title:** | APPLICATION OF OPTIMIZATION TECHNIQUES IN LOGISTICS |
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| **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. |
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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:** | VS |
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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** |
| 30 e-P30 a-P |  |  |  |  |  |  | 90 |  | 6 |
| **a-V** | **e-V** | **LV** |  |
| 6 | 12 | 12 |  |
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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):** |
| * 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).* Osnove DEA (Data Envelopment Analysis) analize (analitični in grafični način reševanja).
 |  | * 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).
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| **Temeljni literatura in viri / Reading materials:** |
| 1. Jensen, P. A., & Bard, J. F. (2003). Operations research: models and methods (str. XII, 675 , 5 pril.). John Wiley & Sons.
2. KRAMBERGER, Tomaž, ŠINKO, Simona. (2022). Optimizacijske metode v logistiki : osnovni problemi linearnega programiranja. 1. izd. Celje: Fakulteta za logistiko Univerze v Mariboru.
3. KRAMBERGER, Tomaž, ŠINKO, Simona. et al. (2022). Optimizacijske metode v logistiki : upravljanje s pretoki in odločanje. 1. izd. Celje: Fakulteta za logistiko Univerze v Mariboru.
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| **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
 |  | 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 |
| 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. |  | 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.**Vaje:**Ocena e-vaj. | 80%20% | **Lectures:**Written examination.**Tutorials:**Grade from e-tutorials. |

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| **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](https://doi.org/10.1504/IJSTL.2018.10008533). [COBISS.SI-ID [512889661](https://plus.si.cobiss.net/opac7/bib/512889661?lang=sl)].
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](https://doi.org/10.1016/j.jairtraman.2017.12.003). [COBISS.SI-ID [512892733](https://plus.si.cobiss.net/opac7/bib/512892733?lang=sl)].
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](https://doi.org/10.1057/mel.2015.25). [COBISS.SI-ID [512702781](https://plus.si.cobiss.net/opac7/bib/512702781?lang=sl)].
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](https://plus.si.cobiss.net/opac7/bib/512879421?lang=sl)].
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](https://doi.org/10.7307/ptt.v27i3.1611). [COBISS.SI-ID [512689725](https://plus.si.cobiss.net/opac7/bib/512689725?lang=sl)].
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