UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Ime predmeta:	KVANTITATIVNO MODELIRANJE V LOGISTIKI
Course title:	QUANTITATIVE 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.	3.
SYSTEM LOGISTICS 1st degree		2.	3.

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
		a-V	**e-V**	**LV**				
30 a-P 30 e-P		9	9	12			150	8

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):**
• Sistem linearnih enačb in neenačb (ponovitev reševanja sistemov linearnih enačb z več neznankami s pomočjo Gaussove eliminacijske metode in matričnih enačb, reševanje sistemov linearnih neenačb z grafično metodo), • konveksne množice in določanje ekstremnih točk, • linearno programiranje (formulacija problema, reševanje na grafični način, reševanje s programskim paketom LINGO in orodjem Microsoft Excel, analiza občutljivosti rešitve), • celoštevilsko programiranje, • osnove teorije grafov (pretvorba problemov pretovora, razvrščanja, maksimalnega pretoka, ipd. na linearne optimizacijske probleme), • DEA (Data Envelopment Analysis) analiza,	• Systems of linear equations and inequations (revision of solving linear equations using Gauss elimination method and matrix equations, solving systems of linear inequations using the graphic method), • convex sets and determining extreme points, • linear programming (problem formulation, solving problems using graphical method, solving problems using LINGO and Microsoft Excel software, sensitivity analysis of the solution); • integer linear programming, • basics of graph theory (transforming transhipment, assignment, maximum flow, etc. to linear optimization problems), • DEA (Data Envelopment Analysis), • AHP (Analitical Hierarchy Process) method.

• AHP (Analitical Hierarchy Process) metoda.	

Temeljni literatura in viri / Reading materials:

E-gradivo predmeta.
Kramberger, T.: Kvantitativne metode v logistiki, Fakulteta za logistiko, Celje, 2019.
KRAMBERGER, T.: Osnove modeliranja u logistici. Subotica: [Ekonomski fakultet], 2015. 290 str., ilustr. ISBN 978-86-84819-98-9. [COBISS.SI-ID 512672317].
Meško, I. Optimizacija poslovanja. Ekonomsko-poslovna fakulteta, Maribor, 1997.
Čižman, A.: Operacijske raziskave : teorija in uporaba v organizaciji, Kranj, Moderna organizacija, 2003.
Winston, W. L.: Operations Research; Applications and algorithms. Thomson Learning, Belmont, CA, 4th ed.
Waters. D.: Quantitative Methods for Business, Addison Wesley, Essex, 1997, ISBN: 0-201-403978,COBISS.SI-ID: 9076454.

Cilji in kompetence:

Študenti:
- spoznajo in se naučijo osnov upravljanja logističnih sistemov spomočjo kvantitativnih metod,
- razumejo koncept operacijskih raziskav in razvijejo sposobnost reševanja problemov v logističnih sistemih z linearnim in celoštevilskim linearnim modelom,
- razvijejo sposobnost interpretacije dobljene rešitve,
- se naučijo na podlagi izbranega kriterija rešitev še izboljšati.

Objectives and competences:

Students:
- are farmiliarized with and study the basics for managing logistics systems using quantitative methods,
- understand the concept of operational research and develop problem solving skills in logistics systems using the linear and whole number linear model,
- develop the skills to interpret the gained results,
- learn how to improve the solution based on the chosed criteria.

Predvideni študijski rezultati:

Znanje in razumevanje:
Študenti
- se naučijo reševati sisteme linearnih neenačb na grafični način,
- se naučijo osnov lieaenega programiranja,
- uporabijo linearno programiranje za reševanje osnovnih logističnih problemov,
- se naučijo uporabe programskega paketa LINGO in programa Mixrosoft Excel za reševanje linearnih programov,
- se naučijo koncepte celoštevilskega linearnega programiranja, ter znajo tudi nekaj izmed problemov teorije grafov pretvoriti na problem linearnega programiranja,
- se naučijo uporabljati DEA analizo in AHP metodo.

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 Temelji logistike in oskrbovalnih verig, Management trajnostnih

Intended learning outcomes:

Knowledge and understanding:
Students:
- learn to solve systems of linear inequasions using graphs,
- learn the basics of linear programming,
- learn to use linear programming to solve basic logistics problems,
- learn to use LINGO and Microsoft Excel software to solve linear programmes,
- learn to use concept of integer linear programming, and knows how to transform some of the graph theory problems to linear program problems,
- learn to use DEA and AHP method.

Transferable/Key Skills and other attributes:
Students learn to apply theoretical knowledge to practical examples, especially processes from the following modules: Fundamentals of logistics and supply chain, Management sustainable supply chain,

oskrbovalnih verig, Načela logističnih aktivnosti in Ekonomika v logistiki v prvem letniku.	Principles of logistics activities, 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). Students enhance their theoretical knowledge and are able to apply it. Part of the seminar is in a classroom, part represents the laboratory work, and 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:**
▪ Pisni izpit.	80%	▪ Written examination.
▪ E- predavanja in e-vaje.	20%	▪ E-lectures and e-courses.

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.