UČNI NAČRT PREDMETA/COURSE SYLLABUS	
Predmet:	OSNOVE PROSTORSKEGA MODELIRANJA
Course title:	BASICS OF SPATIAL MODELLING

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
GOSPODARSKA IN TEHNIŠKA LOGISTIKA 1.stopnja		2.	3.
PROFESSIONAL HIGHER EDUCATION STUDY PROGRAMME ECONOMIC AND TECHNICAL LOGISTICS 1st degree		2.	3.

Vrsta predmeta / Course type	OBVEZNI
Univerzitetna koda predmeta / University course code:	VS

Predavanja ectures	Seminar Seminar	vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
15 e-P 21 a-P		24 e-V 30 RV			90	6

Nosilec predmeta / Lecturer:	KLEMEN PRAH
Jeziki / Languages: Predavanja / Lectures:	SLOVENSKI / SLOVENE
Vaje / Tutorial:	SLOVENSKI / SLOVENE

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisits:
Ni pogojev.	None.

Vsebina:	Content (Syllabus outline):
1. Logistika in geografski prostor (prostorska organizacija, lokacija).	1. Logistics and geographical space (spatial organization, location).
2. Teoretične osnove GIS (osnovni pojmi, georeferenciranje, prostorski podatki).	2. Theoretical bases of GIS (basic concepts, georeferencing, spatial data).
3. Modeliranje logističnega omrežja z GIS (elementi omrežja, povezljivost, tipi atributov, naročila, prometne razmere, usmerjanje).	3. Modeling of logistics network with GIS (network elements, connectivity, attribute types, orders, traffic conditions, directions).
4. Izvedba logistično-transportne mrežne analize na praktičnih primerih iz logistike (najboljša pot, najbližji objekt, storitveno območje, stroškovna matrika, VRP problem, parna naročila).	4. Implementation of logistics-transport network analysis on practical logistical examples (best route, closest facility, service area, OD cost matrix, VRP problem, paired orders).
5. Uporaba programske opreme ArcGIS Pro na logističnih primerih.	5. Use of ArcGIS Pro software on logistic cases.
6. Alternativni GIS programi na področju transporta (pregled): Simulation of Urban MObility (SUMO), NetLogo, QGIS.	6. Alternative GIS programs in the field of transport (review): Simulation of Urban MObility (SUMO), NetLogo, QGIS.

Temeljni literatura in viri / Readings:

1. E-gradivo predmeta.
2. Longely, P.A., Goodchild, M.F., Maguire, D.J., Rhind, D.W. (2015). Geographic Information Systems & Science. 4th Edition. John Wiley & Sons.
3. Sarkar, A. (2007). GIS Applications in Logistics: A Literature Review. School of Business, University of Redlands. http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.453.2280
4. Law, M., Collins, A. (2018). Getting to Know ArcGIS Pro. Esri press.
5. ArcGIS Pro: https://www.esri.com/en-us/arcgis/products/arcgis-pro/resources

Cilji in kompetence:

Cilji predmeta so:

- priprava in usposobitev študenta za načrtovanje in optimiziranje logistično-transportnih dejavnosti z uporabo GIS na operativnem nivoju,
- opredelitev logistike v konceptu geografskega prostora, prostorske organizacije in lokacije,
- opredelitev teoretičnih osnov GIS,
- modeliranje logističnega omrežja z GIS,
- načrtovanje in analiziranje logistično-transportnih primerov različnega tipa z GIS,
- uporaba programske opreme Esri ArcGIS Pro za načrtovanje in izvedbo mrežne analize na logističnem primeru ter ovrednotenje rezultata,
- primerjava alternativnih GIS programov na področju transporta.

Kompetence, ki jih pridobijo študenti:

- razvijajo geovizualizacijske sposobnosti,
- razvijajo prostorske predstave s poudarkom na logistiki in transportu,
- uporabljajo prostorske podatke različnih podatkovnih zbirk,
- poznajo trende hitrega razvoja geografskih informacijskih sistemov in prostorskih podatkov,
- razvijajo digitalno kompetenco naprednega dela z geoprostorskimi podatki in kartografskimi prikazi,
- načrtujejo in optimizirajo logistično-transportne dejavnosti z uporabo GIS na operativnem nivoju.

Objectives and competences:

The aims of this course are:

- preparation and training of students for planning and optimization of logistics-transport activities using GIS at the operational level,
- definition of logistics in the concept of geographical space, spatial organization and location,
- definition of theoretical bases of GIS,
- modeling of logistics network with GIS,
- planning and analyzing logistics-transport cases of various types with GIS,
- use of Esri ArcGIS Pro software to plan and perform network analysis on a logistic case and evaluate the result,
- comparison of alternative GIS programs in the field of transport.

Competences acquired by students:

- develop geovisualization skills,
- develop spatial perception with an emphasis on logistics and transport,
- use spatial data from different databases,
- know the trends of rapid development of geographic information systems and spatial data,
- develop digital competence of advanced work with geospatial data and cartographic representations,
- plan and optimize logistics and transport activities using GIS at the operational level.

Predvideni študijski rezultati:

Znanje in razumevanje:
Študent bo ob zaključku predmeta zmožen:

- razložiti umeščenost logistike v geografski prostor, prostorsko organizacijo logistike ter pomen lokacije v logistiki,
- definirati in razložiti teoretične osnove GIS, ki se nanašajo na osnovne pojme, georeferenciranje in prostorske podatke,
- modelirati logistično omrežje z GIS ter pri tem vključiti elemente omrežja, povezljivost, tipe

Intended learning outcomes:

Knowledge and understanding:
The student will be able to:

- explain the position of logistics in the geographical space, the spatial organization of logistics and the importance of location in logistics,
- define and explain the theoretical foundations of GIS, which refer to basic concepts, georeferencing and spatial data,

atributov, naročila, prometne razmere in usmerjanja, • načrtovati in analizirati logistično-transportne primere različnega tipa z GIS, • uporabiti programsko opremo Esri ArcGIS Pro za načrtovanje in izvedbo mrežne analize na logističnem primeru ter ovrednotiti rezultat, • primerjati alternativne GIS programe na področju transporta, npr. Simulation of Urban MObility (SUMO), NetLogo, QGIS.	• model the logistics network with GIS, including network elements, connectivity, attribute types, orders, traffic conditions and directions, • plan and analyze logistic-transport cases of different types with GIS, • use Esri ArcGIS Pro software to plan and perform network analysis on a logistic case and evaluate the result, • compare alternative GIS programs in the field of transport, e.g. Simulation of Urban MObility (SUMO), NetLogo, QGIS.

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 računalniški učilnici, 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 computer 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 %) / Weight (in %)	Assessment:
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 del izpita iz teorije. • Pisni del izpita z GIS programom. • Seminarska naloga.	35% 35%	• Written examination from theory. • Written examination wit GIS program. • Seminar paper.
Za pozitivno oceno predmeta mora biti pozitiven vsak pisni del izpita posebej.	30%	For a positive assessment of the subject, each written part of the exam must be positive.

Reference nosilca / Lecturer's references:

1. PRAH, Klemen, KRAMBERGER, Tomaž, DRAGAN, Dejan. Primerjava 2D in 3D GIS modela pri načrtovanju šolskih prevozov. Dela. [Tiskana izd.]. 2018, [št.] 49, str. 61-74, ilustr. ISSN 0354-0596. https://doi.org/10.4312/dela.49.61-74, DOI: 10.4312/dela.49.61-74.
2. ŠINKO, Simona, PRAH, Klemen, KRAMBERGER, Tomaž. Spatial modelling of modal shift due to COVID-19. Sustainability. 2021, vol. 13, iss. 13, str. 1-15, ilustr. ISSN 2071-1050. https://doi.org/10.3390/su13137116, DOI: 10.3390/su13137116.
3. PRAH, Klemen, KESHAVARZSALEH, Abolfazl, KRAMBERGER, Tomaž, JEREB, Borut, DRAGAN, Dejan. Optimal bus stops' allocation : a school bus routing problem with respect to terrain elevation. Logistics & sustainable transport. [Spletna izd.]. October 2018, vol. 9, no. 2, str. 1-15, ilustr. ISSN 2232-4968. https://www.degruyter.com/view/j/jlst.2018.9.issue-2/jlst-2018-0006/jlst-2018-0006.xml?format=INT, DOI: 10.2478/jlst-2018-0006.
4. PRAH, Klemen, KRAMBERGER, Tomaž, RUPNIK, Bojan. The role of GIS in port hinterland modelling based on port choice. V: VIDOVIĆ, Milorad (ur.). Proceedings of the 3rd Logistics International Conference, Belgrade, 25-27 May, 2017. Belgrade: Faculty of Transport and Traffic Engineering, 2017. Str. 111-116, ilustr. ISBN 978-

86-7395-373-1. http://logic.sf.bg.ac.rs/wp-content/uploads/2017/LOGIC%202017%20Proceedings%20b5.pdf.
5. PRAH, Klemen, SHORTRIDGE, Ashton. Travels in San Francisco: effect of terrain on road network distance. V: 2019 East Lakes Division of the American Association of Geographers Annual Meeting, October 10-11, 2019, University Center, Michigan. [Saginaw: College of Arts & Behavioral Sciences, 2019]. Str. 33.