UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Ime predmeta:	PRINCIPI MODELIRANJA V LOGISTIKI
Course title:	PRINCIPLES OF MODELLING IN LOGISTICS

Študijski program in stopnja Study programme and cycle	Študijska smer Study option	Letnik Year of study	Semester Semester
LOGISTIKA SISTEMOV 2. stopnja		2.	4.
SYSTEM LOGISTICS 2nd degree		2.	4.

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

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Clinical training	Druge oblike študija Other forms of study	Samost. delo Individual work	ECTS
24 e-P 21 a-P		12 e-V 28 a-V			65	5

Nosilec predmeta / Course coordinator:	**JANEZ ŽEROVNIK**
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):**
• Osnovni pojmi teorije grafov. • Definicije in primeri uporabe grafov. • Eulerjevi grafi. • Hamiltonovi grafi. • Povezanost grafov. • Optimizacija nad drevesi. • Algoritmi za reševanje problemov iz Teorije grafov. • Reševanje problema najkrajše poti. • Reševanje problema maksimalnega pretoka. • Reševanje problema pretoka z najmanjšimi stroški. • Reševanje problema nahrbtnika. • Reševanje problema trgovskega potnika. • Reševanje problema razporejanja in usmerjanja vozil.	• Ontology of graph theory. • Definitions and applications of graph theory. • Euler graphs. • Hamiltonian graphs. • Connectivity of graphs. • Optimization involving trees. • Algorithms for solving the problems of graph theory. • Solving the problem of the shortest path. • Solving the problem of the maximum flow. • Solving the problem of the minimum cost flows. • Solving the knapsack problem. • Solving the salesman problem. • Solving the vehicle routing problem. • Illustrative and practical examples in the field of logistics.

• Ilustrativni in praktični zgledi iz logistike.	

Temeljni literatura in viri / Reading materials:

E-gradivo predmeta.
Balakrishnan, V.K.: Schaum's Outline of Graph Theory, McGraw-Hill,1st edition, 1997.
Wilson, R.J.,Watkins, J.J.: Uvod v teorijo grafov, Društvo matematikov, fizikov in astronomov Slovenije, Ljubljana, 1997.
Korte, B., Vygen, J.: Combinatorial optimization, Theory and Algorithms, 4th ed., Springer, 2008.
Diestel, R.: Graph theory, Springer-Verlag, New York, 2005.
Bondy, J.A.,Murty, U.S.R.: Graph theory, Graduate texts in mathematics series, Springer, 2008.

Cilji in kompetence:

Cilj tega predmeta je:
- nadgraditi pojme iz teorije grafov,
- spoznati raziskovalno področje teorije grafov v logističnih procesih in ga prepoznati kot morebitno polje bodočega znanstvenega dela,
- pridobiti poglobljeno razumevanje iz teorije grafov v logističnih procesih,
- se usposobiti za učinkovito reševanje zahtevnejših problemov na področju uporabe teorije grafov v logističnih procesih,
- se usposobiti za samostojno znanstveno raziskovalno delo na tem področju,
- se usposobiti za predstavitev svojega raziskovalnega dela (članki, referati).

Objectives and competences:

The objective of the course is to:
- enhance the understanding of graph theory,
- introduce the research field of the graph theory in logistics processes, and recognize the possibility of its adoption for research work in the future,
- gain the ability of deeper understanding of graph theory in the logistics processes,
- qualify for efficient solving of more complicated problems in the field of applications of graph theory in logistics processes,
- qualify for independent research and scientific work in this field,
- qualify for presentation of scientific work by publishing it (papers).

Predvideni študijski rezultati:

Študent je ob koncu študija sposoben obvladati raziskovalne metode in postopke na področju uporabe teorije grafov v logističnih procesih.

Sposobnost za samostojno znanstveno raziskovalno delo na področju uporabe teorije grafov v logističnih procesih.
Sposobnost učinkovitega reševanja zahtevnejših problemov na tem področju.
Razumevanje uporabe raziskovalnih metod z zmožnostjo poglobljene analize problemov in sistemskega razmišljanja na tem področju.
Zmožnost ustvarjalnega sodelovanja pri reševanju težjih problemov v logističnih okoljih.

Intended learning outcomes:

Graduated student is able to deal with research methods and procedures in the field of applications of graph theory in logistics processes.

The ability of independent scientific and research work in the field of applications of graph theory in logistics processes.
The ability of efficient solving of more complicated problems in this field.
Understanding the use of research methods with the ability of in-depth analysis and system reflection of the identified problems.
The ability of creative collaboration in order to deal with solving of more difficult problems in logistics environments.

Metode poučevanja in učenja:

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

Learning and teaching methods:

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-

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 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).	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:**
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.
• Opravljen seminar.	30%	• Course work.
• Pisni izpit.	40%	• Written exammination.
• Ustni izpit.	30%	• Oral examination.

Reference nosilca / Course coordinator's references:

1. ŽEROVNIK, Janez. Experiments with a randomized algorithm for a frequency assignement problem. WSEAS Trans. Math., Oct. 2004, vol. 3, iss. 4, str. 801-806. [COBISS.SI-ID 9014038].
2. ŽEROVNIK, Janez. On recognition of strong graph bundles. Math. slovaca, 2000, vol. 50, no. 3, str. 289-301. [COBISS.SI-ID 5540630].
3. ŽEROVNIK, Janez. On temperature schedules for generalized Boltzmann machine. Neural Netw. World, 2000, vol. 10, no.3, str. 495-503. [COBISS.SI-ID 5539606].
4. ŽEROVNIK, Janez. On the convergence of a randomized algorithm frequency assignment problem. Central European j. operat. resear. econom., 1998, let. 6, št. 1-2, str. 135-151. [COBISS.SI-ID 4322070]
5. ŠPARL, Petra, WITKOWSKI, Rafeł, ŽEROVNIK, Janez. 1-local 7/5-competitive algorithm for multicoloring hexagonal graphs. Algorithmica, 2012, vol. 64, no. 4, str. 564-583, doi:10.1007/s00453-011-9562-x. [COBISS.SI-ID 7055123].
6. REMIC, Maja, ŽEROVNIK, Gašper, ŽEROVNIK, Janez. An experimental comparison of some heuristics for cardinality constrained bin packing problem. Business systems research journal, 2012, vol. 3, no. 2, str. 57-63, ilustr. [COBISS.SI-ID 12458267].
7. KRAMBERGER, Tomaž, ŽEROVNIK, Janez, ŠTRUBELJ, Gregor, PRAH, Klemen. GIS technology as an environment for testing an advanced mathematical model for optimization of road maintenance. Cent. Eur. j. oper. res., Online First, 27 August 2012, doi: 10.1007/s10100-012-0265-4. [COBISS.SI-ID 512429885].
8. ERVEŠ, Rija, ŽEROVNIK, Janez. Mixed fault diameter of Cartesian graph bundles. Discrete appl. math.. [Print ed.], Available online 10. December 2011, doi: 10.1016/j.dam.2011.11.020. [COBISS.SI-ID 15997718].
9. SAU WALLS, Ignasi, ŠPARL, Petra, ŽEROVNIK, Janez. Simpler multicoloring of triangle-free hexagonal graphs. Discrete math.. [Print ed.], 2012, vol. 312, iss. 1, str. 181-187.http://dx.doi.org/10.1016/j.disc.2011.07.031. [COBISS.SI-ID 6917907].