

UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2016/17)						
<b>Predmet:</b>		Operacijske raziskave				
<b>Course title:</b>		Operational research				
<b>Študijski program in stopnja</b> Study programme and level		<b>Študijska smer</b> Study field		<b>Letnik</b> Academic year	<b>Semester</b> Semester	
Univerzitetni študijski program Finančna matematika		ni smeri		2	prvi	
First cycle academic study programme Financial Mathematics		none		2	first	
<b>Vrsta predmeta / Course type</b>				obvezni / compulsory		
<b>Univerzitetna koda predmeta / University course code:</b>				M0364		
<b>Predavanja</b> Lectures	<b>Seminar</b> Seminar	<b>Vaje</b> Tutorial	<b>Klinične vaje</b> work	<b>Druge oblike študija</b>	<b>Samost. delo</b> Individ. work	<b>ECTS</b>
30		30			90	5
<b>Nosilec predmeta / Lecturer:</b>		prof. dr. Sergio Cabello Justo, prof. dr. Matjaž Konvalinka, prof. dr. Marko Petkovšek				
<b>Jeziki / Languages:</b>		<b>Predavanja / Lectures:</b>		slovenski / Slovene		
		<b>Vaje / Tutorial:</b>		slovenski / Slovene		
<b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>				<b>Prerequisites:</b>		
Vpis v letnik študija.				Enrolment in the programme.		
Opravljeni predmeti Optimizacijske metode, Uvod v programiranje in Diskretna matematika 1.				Completed courses Optimization methods, Introduction to programming and Discrete mathematics 1.		
<b>Vsebina:</b>				<b>Content (Syllabus outline):</b>		

<p>Modeliranje problemov iz resničnega življenja.</p> <p>Celoštevilsko linearno programiranje.</p> <p>Dinamično programiranje.</p> <p>Najkrajše poti v grafih. Topološko urejanje.</p> <p>Osnovne teorije odločanja.</p> <p>Dodatne teme so izbrane z naslednjega seznama:</p> <p>Trdna prirejanja in posplošitve.</p> <p>Predstavitev podatkov.</p> <p>Načrtovanje projektov (CPM/PERT).</p> <p>Poštena delitev.</p> <p>Vodenje zalog.</p> <p>Večkriterijska optimizacija.</p> <p>Razvrščanje.</p> <p>Razmeščanje.</p> <p>Uporaba markovskih verig.</p> <p>Simulacije.</p> <p>Napovedovanje.</p> <p>Načrtovanje poskusov.</p>	<p>Modelling real-world problems.</p> <p>Integer linear programming.</p> <p>Dynamic programming.</p> <p>Shortest paths in graphs. Topological sorting.</p> <p>Basic decision theory.</p> <p>Additional topics selected from the following list:</p> <p>Stable matchings.</p> <p>Data presentation.</p> <p>Project management (CPM/PERT).</p> <p>Fair division.</p> <p>Inventory theory.</p> <p>Multicriteria Optimization.</p> <p>Scheduling.</p> <p>Facility location.</p> <p>Applications of Markov chains.</p> <p>Simulations.</p> <p>Forecasting.</p> <p>Design of experiments.</p>
--	---

**Temeljni literatura in viri / Readings:**

V. Batagelj: Operacijske raziskave. Skripta v pripravi. <http://vlado.fmf.uni-lj.si/vlado/or/or.htm>

D. C. Montgomery: Design and analysis of experiments. John Wiley & Sons, 1997.

F.S. Hillier in G.J. Lieberman: Introduction to operations research. McGraw-Hill Higher Education,

2010.

W.L. Winston: Operation Research, Applications and Algorithms. PWS-KENT, Boston, MA 1991.

F.S. Roberts: Discrete Mathematical Models. Prentice-Hall, Englewood Cliffs, New Jersey, 1976.

T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein: Introduction to Algorithms, 2. izdaja, MIT Press, Cambridge, 2001.

**Cilji in kompetence:**

Uvod v modele, metodologijo in orodja, ki se uporabljajo v operacijskih raziskavah.

**Objectives and competences:**

Introduction to the models, methodology and tools used in operations research.

**Predvideni študijski rezultati:**

Znanje in razumevanje: Razumevanje modelov, metodologij in orodij, ki se uporabljajo v operacijskih raziskavah

Uporaba: Metodično reševanje problemov vsakdanjega življenja, ki so povezani z iskanjem optimalnega vodenja določenega sistema.

Refleksija: Povezanost med teoretičnimi napovedmi o optimalnem vodenju in dejanskim obnašanjem sistema.

Prenosljive spretnosti – niso vezane le na en predmet: Pomen metodičnega reševanja vsakdanjih problemov.

**Intended learning outcomes:**

Knowledge and understanding: Understanding of models, methodologies and tools used in operations research

Applications: Methodical approach to problem solving related to optimal managing of systems in everyday life.

Reflection: The relation between theoretical predictions on the optimal management and the actual behavior of the system

Transferable skills: Relevance of a methodical approach to problem solving.

**Metode poučevanja in učenja:**

**Learning and teaching methods:**

Predavanja, vaje, domače naloge, konzultacije	Lectures, exercises, homework, consultations
---	--

		Delež (v %) / Weight (in %)	Assessment:
Načini ocenjevanja:			
Način (pisni izpit, ustno izpraševanje, naloge, projekt):			Type (examination, oral, coursework, project):
izpit iz vaj	50%		written exam
izpit iz teorije	50%		oral exam
ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)			grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

#### Reference nosilca / Lecturer's references:

<p>Sergio Cabello:</p> <p>CABELLO, Sergio, ROTE, Günter. Obnoxious centers in graphs. SIAM journal on discrete mathematics, ISSN 0895-4801, 2010, vol. 24, no. 4, str. 1713-1730. [COBISS.SI-ID 15762265]</p> <p>BUCHIN, Kevin, CABELLO, Sergio, GUDMUNDSSON, Joachim, LÖFFLER, Maarten, LUO, Jun, ROTE, Günter, SILVEIRA, Rodrigo I., SPECKMANN, Bettina, WOLLE, Thomas. Finding the most relevant fragments in networks. Journal of graph algorithms and applications, ISSN 1526-1719, 2010, vol. 14, no. 2, str. 307-336. [COBISS.SI-ID 15629401]</p> <p>CABELLO, Sergio, DÍAZ-BÁÑEZ, José Miguel, LANGERMAN, Stefan, SEARA, Carlos, VENTURA, Inma. Facility location problems in the plane based on reverse nearest neighbor queries. European journal of operational research, ISSN 0377-2217. [Print ed.], 2010, vol. 202, iss. 1, str. 99-106. [COBISS.SI-ID 15160921]</p> <p>Matjaž Konvalinka:</p> <p>KONVALINKA, Matjaž, PAK, Igor. Geometry and complexity of O'Hara's algorithm. Advances in applied mathematics, ISSN 0196-8858, 2009, vol. 42, iss. 2, str. 157-175. [COBISS.SI-ID 15545945]</p> <p>KONVALINKA, Matjaž, PAK, Igor. Triangulations of Cayley and Tutte polytopes. Advances in mathematics, ISSN 0001-8708, 2013, vol. 245, str. 1-33. [COBISS.SI-ID 16706905]</p> <p>DOLŽAN, David, KONVALINKA, Matjaž, OBLAK, Polona. Diameters of connected components of commuting graphs. The electronic journal of linear algebra, ISSN 1081-3810, 2013, vol. 26, str. 433-</p>
---

445. [COBISS.SI-ID 16707161]

Marko Petkovšek:

BRESSLER, Andrew, GREENWOOD, Torin, PEMANTLE, Robin, PETKOVŠEK, Marko. Quantum random walk on the integer lattice: examples and phenomena. V: AMS Special Sessions on Algorithmic Probability and Combinatorics, October 5-6, 2007, DePaul University, Chicago (Illinois), October 4-5, 2008, University of British Columbia, Vancouver (BC, Canada). LLADSER, Manuel (ur.), et al. Algorithmic probability and combinatorics : AMS special sessions on algorithmic probability and combinatorics, October 5-6, 2007, DePaul University, Chicago, Illinois, October 4-5, 2008, University of British Columbia, Vancouver, BC, Canada, (Contemporary mathematics, ISSN 0271-4132, 520). Providence: American Mathematical Society, cop. 2010, str. 41-60. [COBISS.SI-ID 15813977]

ABRAMOV, Sergei A., PETKOVŠEK, Marko. Polynomial ring automorphisms, rational (w, [sigma])-canonical forms, and the assignment problem. Journal of symbolic computation, ISSN 0747-7171, 2010, vol. 45, no. 6, str. 684-708. [COBISS.SI-ID 15580505]

ABRAMOV, Sergei A., BARKATOU, Moulay A., VAN HOEIJ, Mark, PETKOVŠEK, Marko. Subanalytic solutions of linear difference equations and multidimensional hypergeometric sequences. Journal of symbolic computation, ISSN 0747-7171, 2011, vol. 46, iss. 11, str. 1205-1228. [COBISS.SI-ID 16083033]