

| UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2017/18)                  |                           |   |                              |                                    |                                      |             |
|--|---------------------------|---|------------------------------|------------------------------------|--------------------------------------|-------------|
| <b>Predmet:</b>  |                           | Optimizacijske metode                                     |                              |                                    |                                      |             |
| <b>Course title:</b>   |                           | Optimization methods                                      |                              |                                    |                                      |             |
| <b>Študijski program in stopnja</b><br>Study programme and level             |                           | <b>Študijska smer</b><br>Study field                      |                              | <b>Letnik</b><br>Academic year     | <b>Semester</b><br>Semester          |             |
| Univerzitetni študijski program<br>Finančna matematika                       |                           | ni smeri  |                              | 1                                  | drugi                                |             |
| First cycle academic study<br>programme Financial<br>Mathematics             |                           | none  |                              | 1                                  | second                               |             |
| <b>Vrsta predmeta / Course type</b>  |                           |   |                              | obvezni / compulsory               |                                      |             |
| <b>Univerzitetna koda predmeta / University course code:</b>                 |                           |   |                              | M0314                              |                                      |             |
| <b>Predavanja</b><br>Lectures  | <b>Seminar</b><br>Seminar | <b>Vaje</b><br>Tutorial                                   | <b>Klinične vaje</b><br>work | <b>Druge oblike</b><br>študija     | <b>Samost. delo</b><br>Individ. work | <b>ECTS</b> |
| 45   |                           | 45  |                              |                                    | 90                                   | 6           |
| <b>Nosilec predmeta / Lecturer:</b>  |                           | prof. dr. Sergio Cabello Justo, 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.        |                                      |             |
| <b>Vsebina:</b>  |                           |   |                              | <b>Content (Syllabus outline):</b> |                                      |             |

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| <p>Optimizacijski problemi, primeri. Lokalna optimizacija. Linearno programiranje, metoda simpleksov, dualni problem. Diskretne optimizacijske naloge. Najcenejši razvoz, prirejanja in pokritja, pretoki po omrežju, najcenejše vpeto drevo.</p> <p>Konveksni problemi. Karush-Kuhn-Tuckerjev izrek.</p> | <p>Optimization problems, examples.</p> <p>Local optimization.</p> <p>Linear programming, simplex method, dual problem.</p> <p>Discrete optimization problems.</p> <p>Transshipment problem, matchings and coverings, network flow, minimum spanning tree. Convex problems. Karush-Kuhn-Tucker theorem.</p> |
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### Temeljni literatura in viri / Readings:

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| <p>V. Batagelj: Optimizacijske metode, Zapiski predavanj, Ljubljana. <a href="http://vlado.fmf.uni-lj.si/vlado/optim/opt1.pdf">http://vlado.fmf.uni-lj.si/vlado/optim/opt1.pdf</a> <a href="http://vlado.fmf.uni-lj.si/vlado/optim/lp.pdf">http://vlado.fmf.uni-lj.si/vlado/optim/lp.pdf</a></p> <p>V. Batagelj, M. Kaufman: Naloge iz optimizacijskih metod, Ljubljana. <a href="http://vlado.fmf.uni-lj.si/vlado/optim/optnal.pdf">http://vlado.fmf.uni-lj.si/vlado/optim/optnal.pdf</a></p> <p>Jiří Matoušek, Bernd Gärtner: Understanding and Using Linear Programming, Springer 2007</p> <p>Vašek Chvátal: Linear Programming, W. H. Freeman and Co., New York, 1983</p> <p>Stephen Boyd, Lieven Vandenberghe: Convex Optimization, Cambridge University Press, Cambridge, 2004</p> |
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### Cilji in kompetence:

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| <p>Podati osnovna znanja o optimizacijskih problemih, linearnem programiranju, diskretni optimizaciji in konveksni optimizaciji.</p> |
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### Objectives and competences:

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| <p>To provide a basic knowledge on optimization problems, linear programming, discrete optimization and convex optimization.</p> |
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### Predvideni študijski rezultati:

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| <p>Znanje in razumevanje: Študent pridobi osnovno znanje o linearnem programiranju, algoritmih na grafih in konveksni optimizaciji. Obvlada temeljne optimizacijske postopke in jih zna uporabiti ob pomoči računalnika.</p> <p>Uporaba: Reševanje optimizacijskih problemov</p> |
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### Intended learning outcomes:

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| <p>Knowledge and understanding: The student obtains basic knowledge about linear programming, graph algorithms and convex optimization. He or she is familiar with basic optimization methods and knows how to solve them with a computer.</p> |
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na področjih ekonomije, financ in operacijskih raziskav.

Refleksija: Pomen ustreznega modeliranja problemov iz uporabe za njihovo učinkovito reševanje.

Prenosljive spretnosti – niso vezane le na en predmet: Sposobnost predstavitve različnih praktičnih problemov v obliki matematičnih optimizacijskih nalog. Veščina uporabe izbranega programskega orodja za reševanje osnovnih optimizacijskih problemov.

Application: Solving optimization problems in economics, finance and operations research.

Reflection: The importance of modelling of problems for their effective resolution.

Transferable skills: The ability to present various everyday problems in the form of mathematical optimization tasks. Ability to use computer programs to solve basic optimization problems.

#### Metode poučevanja in učenja:

Predavanja, vaje, laboratorijske vaje, konzultacije

#### Learning and teaching methods:

Lectures, exercises, computer sessions, consultations

#### Načini ocenjevanja:

Delež (v %) /  
Weight (in %)

#### Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

izpit iz vaj

izpit iz teorije

ocene: 1-5 (negativno), 6-10 (pozitivno)  
(po Statutu UL)

50%

50%

Type (examination, oral, coursework, project):

written exam

oral exam

grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

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

Sergio Cabello:

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]

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]

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]

Marko Petkovšek:

PETKOVŠEK, Marko, ZAKRAJŠEK, Helena. Enumeration of l-graphs: Burnside does it again. *Ars mathematica contemporanea*, ISSN 1855-3966. [Tiskana izd.], 2009, vol. 2, no. 2, str. 241-262. [COBISS.SI-ID 15497049]

ABRAMOV, Sergei A., PETKOVŠEK, Marko. On the bottom summation. *Programming and computer software*, ISSN 0361-7688, 2008, vol. 34, no. 4, str. 187-190. [COBISS.SI-ID 15287385]

PETKOVŠEK, Marko. Symbolic computation with sequences. *Programming and computer software*, ISSN 0361-7688, 2006, vol. 32, no. 2, str. 65-70. [COBISS.SI-ID 15287129]