| UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2016/17) | | | |
|---|---|---|---|
| **Predmet:** | Izbrana poglavja iz optimizacije | | |
| **Course title:** | Topics in optimization | | |

| **Študijski program in stopnja**<br>**Study programme and level** | **Študijska smer**<br>**Study field** | **Letnik**<br>**Academic year** | **Semester**<br>**Semester** |
|---|---|---|---|
| Magistrski študijski program<br>Finančna matematika | ni smeri | 1 ali 2 | prvi ali drugi |
| Master's study programme<br>Financial Mathematics | none | 1 or 2 | first or second |

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| **Vrsta predmeta / Course type** | izbirni / elective |
| **Univerzitetna koda predmeta / University course code:** | M2601 |

| **Predavanja**<br>**Lectures** | **Seminar**<br>**Seminar** | **Vaje**<br>**Tutorial** | **Klinične vaje**<br>**work** | **Druge oblike**<br>**študija** | **Samost. delo**<br>**Individ. work** | **ECTS** |
|---|---|---|---|---|---|---|
| **30** | **15** | **30** | | | **105** | **6** |

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| **Nosilec predmeta / Lecturer:** | prof. dr. Sergio Cabello Justo, prof. dr. Emil Žagar |

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| **Jeziki / Languages:** | **Predavanja / Lectures:** | slovenski / Slovene, angleški / English |
| | **Vaje / Tutorial:** | slovenski / Slovene, angleški / English |

| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | **Prerequisites:** |
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| Vpis v letnik študija. | Enrolment in the programme. |
| **Vsebina:** | **Content (Syllabus outline):** |

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| Predavatelj izbere nekatere pomembne teme s področja optimizacije, kot so na primer:<br><br>Matematične osnove metod notranjih točk.<br><br>Zahtevnejši problemi kombinatorične optimizacije.<br><br>Celoštevilsko programiranje.<br><br>Iterativne metode v optimizaciji.<br><br>Hevristike, evolucijsko in genetsko programiranje.<br><br>Praktična uporaba optimizacijskih metod v financah, ekonomiji, logistiki, telekomunikacijah ipd.<br><br>Stohastično programiranje, itd. | The lecturer selects some important topics in optimization, such as:<br>Mathematical foundations of interior-point methods.<br><br>Advanced problems of combinatorial optimization.<br><br>Integer programming.<br><br>Iterative methods in optimization.<br><br>Heuristics, evolutionary and genetic programming.<br><br>Applications of optimization methods in finance, economy, logistics, telecommunications, etc.<br><br>Stochastic programming, etc. |

**Temeljni literatura in viri / Readings:**

S. Boyd, L. Vandenberghe: Convex Optimization, Cambridge University Press, Cambridge, 2004.

J. Renegar: A Mathematical View of Interior-Point Methods in Convex Optimization, Society for Industrial and Applied Mathematics, Philadelphia, 2001.

B. H. Korte, J. Vygen: Combinatorial Optimization: Theory and Algorithms, 3. izdaja, Springer, Berlin, 2006.

L. A Wolsey: Integer Programming, Wiley, New York, 1998.

C. T. Kelley: Iterative Method for Optimization, Society for Industrial and Applied Mathematics, Philadelphia, 1999.

Z. Michalewicz, D. B. Fogel: How to Solve It: Modern Heuristics, 2. izdaja, Springer, Berlin, 2004.

| **Cilji in kompetence:** | **Objectives and competences:** |
|---|---|
| Študent podrobneje spozna eno ali več pomembnejših področij optimizacije. | Students become acquainted with one or several of the more important areas of optimization. |

| Predvideni študijski rezultati: | Intended learning outcomes: |
|---|---|
| Znanje in razumevanje: Slušatelj se natančneje seznani z izbranim področjem optimizacije. Spozna teoretične osnove ter praktične prijeme pri reševanju optimizacijskih nalog z izbranega področja.<br>Uporaba: Reševanje optimizacijskih problemov iz vsakdanjega življenja.<br><br>Refleksija: Pomen ustreznega modeliranja optimizacijskih problemov, kar omogoča njihovo učinkovito reševanje.<br><br>Prenosljive spretnosti – niso vezane le na en predmet: Modeliranje nalog iz vsakdanjega življenja v obliki matematičnih optimizacijskih nalog, zmožnost razločevanja med računsko obvladljivimi in neobvladljivimi problemi, sposobnost samostojnega snovanja modelov in njihove analize s pomočjo računalnika. | Knowledge and understanding: Students gain deeper knowledge of selected optimization areas. They become familiar with both the theoretical foundations and the techniques for solving optimization problems in these areas.Application: Solving optimization problems which arise in practice.Reflection: The importance of adequate modelling of optimization problems which facilitates their efficient solving.Transferable skills: Capabilities to model practical problems as mathematically formulated optimization problems, to distinguish between computationally feasible and infeasible problems, to construct models and to analyze them by means of appropriate software tools. |

| Metode poučevanja in učenja: | Learning and teaching methods: |
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| predavanja, seminar, vaje, domače naloge, konzultacije in samostojno delo študentov | Lectures, seminar, exercises, homework, consultations, and independent work by the students |

| Načini ocenjevanja: | Delež (v %) / Weight (in %) | Assessment: |
|---|---|---|
| Način (pisni izpit, ustno izpraševanje, naloge, projekt):<br>izpit iz vaj (2 kolokvija ali pisni izpit)<br><br>ustni izpitOcene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL) | <br><br><br>50%<br><br>50% | Type (examination, oral, coursework, project):<br>2 midterm exams instead of written exam, written exam<br><br>oral exam<br><br>Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL) |

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

Sergio Cabello:

CABELLO, Sergio, DÍAZ-BÁÑEZ, José Miguel, PÉREZ LANTERO, Pablo. Covering a bichromatic point set with two disjoint monochromatic disks. Computational geometry, ISSN 0925-7721. [Print ed.], 2013, vol. 46, iss. 3, str. 203-212. [COBISS.SI-ID 16326233]

CABELLO, Sergio, GIANNOPOULOS, Panos, KNAUER, Christian, MARX, Dániel, ROTE, Günter. Geometric clustering: fixed-parameter tractability and lower bounds with respect to the dimension. ACM transactions on algorithms, ISSN 1549-6325, 2011, vol. 7, no. 4, article 43 (27 str.). [COBISS.SI-ID 16028761]

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]

Emil Žagar:

JAKLIČ, Gašper, SAMPOLI, Maria Lucia, SESTINI, Alessandra, ŽAGAR, Emil. C [sup] 1 rational interpolation of spherical motions with rational rotation-minimizing directed frames. Computer Aided Geometric Design, ISSN 0167-8396, 2013, vol. 30, iss. 1, str. 159-173. [COBISS.SI-ID 16368729]

JAKLIČ, Gašper, KANDUČ, Tadej, PRAPROTNIK, Selena, ŽAGAR, Emil. Energy minimizing mountain ascent. Journal of optimization theory and applications, ISSN 0022-3239, 2012, vol. 155, is. 2, str. 680-693. ,. [COBISS.SI-ID 4382935]

JAKLIČ, Gašper, ŽAGAR, Emil. Curvature variation minimizing cubic Hermite interpolants. Applied mathematics and computation, ISSN 0096-3003. [Print ed.], 2011, vol. 218, iss. 7, str. 3918-3924. [COBISS.SI-ID 16049241]