UČNI NAČRT PREDMETA / COURSE SYLLABUS			
Predmet:	Optimizacija 2		
Course title:	Optimization 2		

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Magistrski študijski program Matematika	ni smeri	1 ali 2	prvi ali drugi
Master's study programme Mathematics	none	1 or 2	first or second

Vrsta predmeta / Course type	izbirni
Univerzitetna koda predmeta / University course code:	M2612

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

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

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:**
Vsebina:	**Content (Syllabus outline):**

Konveksne množice in funkcije, konveksno programiranje. Lagrangeova prirejenost, dualna naloga, šibka in krepka dualnost. Slaterjev pogoj, Karush-Kuhn-Tuckerjev izrek. Optimizacijski problemi z linearnimi omejitvami, kvadratično in semidefinitno programiranje s posplošitvami. Numerični postopki, kazenske metode. Celoštevilsko programiranje. Kratek pregled računalniških orodij za reševanje optimizacijskih problemov.	Convex sets and functions, convex programming. Lagrange duality, dual problem, weak and strong duality. Slater's condition, the Karush-Kuhn-Tucker theorem. Linearly constrained optimization problems, quadratic and semidefinite programming with generalizations. Numerical procedures, penalty functions. Integer programming.A short overview of software tools for solving optimization problems.

Temeljni literatura in viri / Readings:

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

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

Cilji in kompetence:	**Objectives and competences:**
Študent spozna osnovne vrste problemov matematičnega programiranja s poudarkom na konveksnih problemih. Seznami se z osnovnimi matematičnimi prijemi za njihovo reševanje, hkrati pa za praktično reševanje uporablja tudi ustrezne računalniške pakete.	Students encounter the fundamental types of problems in mathematical programming, with emphasis on the convex ones. They get to know the basic mathematical tools for tackling these problems, using appropriate software packages for solving them in practice.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent je sposoben z matematičnim modelom dobro opisati različne pomembne uporabne probleme. Pozna osnovne prijeme in računalniška orodja za učinkovito reševanje dobljenih optimizacijskih problemov. Uporaba: Reševanje optimizacijskih problemov iz prakse. Refleksija: Pomen predstavitve praktičnih problemov v formalizirani obliki, ki omogoča	Knowledge and understanding: Students are able to model various important applied problems accurately. They are familiar with the basic techniques and software tools that can be used to solve the resulting optimization problems efficiently.Application: Solving optimization problems which appear in practice.Reflection: The importance of representing practical problems in a formal way which helps to solve them efficiently and adequately.Transferable skills: Ability to model practical problems as mathematically

njihovo učinkovito in pravilno reševanje. 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.	formulated optimization problems, to distinguish between computationally feasible and infeasible problems, to construct models on one's own and to analyze them by means of appropriate software tools.

Metode poučevanja in učenja:	**Learning and teaching methods:**
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): izpit iz vaj (2 kolokvija ali pisni izpit) ustni izpitOcene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)	50% 50%	Type (examination, oral, coursework, project): 2 midterm exams instead of written exam, written exam oral exam Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Sergio Cabello Justo:

– 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]

– 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, 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]

Emil Žagar:

– 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]

– 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]