

UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2016/17)						
Predmet:		Izbrana poglavja iz računalniške matematike				
Course title:		Topics in mathematical foundations of computer science				
Študijski program in stopnja Study programme and level		Študijska smer Study field		Letnik Academic year		Semester Semester
Magistrski študijski program Finančna matematika		ni smeri		1 ali 2		prvi ali drugi
Master's study programme Financial Mathematics		none		1 or 2		first or second
Vrsta predmeta / Course type				izbirni / elective		
Univerzitetna koda predmeta / University course code:				M2609		
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. dr. Andrej Bauer, prof. dr. Sergio Cabello Justo, prof. dr. Marko Petkovšek				
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:		
Vpis v letnik študija.				Enrolment in the programme.		
Vsebina:				Content (Syllabus outline):		

<p>Predavatelj izbere nekatere pomembne teme s področja računalniške matematike, kot so na primer:</p> <p>Računska geometrija in geometrijska optimizacija.</p> <p>Računska topologija.</p> <p>Algoritmi na grafih.</p> <p>Vizualizacija grafov in podatkov.</p> <p>Računalniška grafika.</p> <p>Računalniški vid.</p> <p>Matroidi.</p> <p>Algoritmična teorija iger.</p> <p>Aproksimacijski algoritmi.</p> <p>Vzporedni algoritmi.</p> <p>Algoritmi za tokove podatkov.</p> <p>Simbolno računanje.</p> <p>Bioinformatika.</p>	<p>The lecturer selects some important topics in computational mathematics, such as:</p> <p>Computational geometry and geometric optimization.</p> <p>Computational topology.</p> <p>Graph algorithms.</p> <p>Graph and data visualization.</p> <p>Computer graphics.</p> <p>Computer vision.</p> <p>Matroids.</p> <p>Algorithmic game theory.</p> <p>Approximation algorithms.</p> <p>Parallel algorithms.</p> <p>Algorithms for data streams.</p> <p>Symbolic computation.</p> <p>Bioinformatics.</p>
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Temeljni literatura in viri / Readings:

M. de Berg, O. Cheong, M. van Kreveld, M. Overmars: Computational Geometry: Algorithms and Applications, 3. izdaja, Springer-Verlag, 2008.

S. Har-Peled: Geometric approximation algorithms, AMS, 2011.

H. Edelsbrunner, J.L. Harer: Computational Topology. An Introduction, AMS, 2010.

G. Di Battista, P. Eades, R. Tamassia, I.G. Tollis: Graph Drawing: Algorithms for the Visualization of Graphs, Prentice Hall, 1998.

C. H. Lampert: Kernel Methods in Computer Vision, Foundations and Trends in Computer Graphics and Vision 4 (2009) 193-285.

B. Mohar: Teorija matroidov, DMFAS, Ljubljana, 1996.

N. Nisan, T. Roughgarden, E. Tardos (ur.): Algorithmic Game Theory, Cambridge University Press, 2007.

D.P. Williamson, D.B. Shmoys: The Design of Approximation Algorithms, Cambridge University Press, 2011.

J. JaJa. Introduction to parallel algorithms. Addison-Wesley, 1992.

S. Muthukrishnan: Data Streams: Algorithms and Applications, Foundations & Trends in Theoretical Computer Science, 2005.

J. von zur Gathen, J. Gerhard: Modern Computer Algebra, 3rd ed., Cambridge University Press, 2013.

M. Kauers, P. Paule: The concrete tetrahedron. Symbolic sums, recurrence equations, generating functions, asymptotic estimates, Springer, 2011.

N. C. Jones, P. A. Pevzner: An Introduction to Bioinformatics Algorithms, MIT Press, Cambridge MA, 2004.

Znanstveni članki.

Cilji in kompetence:

Študent spozna osnove nekaterih pomembnih področij računalniške matematike.

Objectives and competences:

The students get acquainted with some important and actual areas of computational mathematics.

Predvideni študijski rezultati:

Znanje in razumevanje: Slušatelj se natančneje seznanj z izbranim področjem računalniške matematike. Spozna teoretične osnove ter praktične prijeme z izbranega področja. Uporaba Reševanje računalniških problemov iz različnih področij.

Refleksija: Študentje spoznajo računalniške probleme in modeliranje. Povezanost med teorijo in prakso.

Intended learning outcomes:

Knowledge and understanding: Students gain deeper knowledge of selected areas in computational mathematics. They become familiar with both the theoretical foundations and the techniques for solving problems in these areas. Application: Solving computational problems from different areas. Reflection: The students see computational problems and modelling. Connection between theory and praxis. Transferable skills: Use of algorithmic thinking for solving imperfectly defined

Prenosljive spretnosti – niso vezane le na en predmet: Uporaba algoritmičnega mišljenja pri reševanju nepopolno definiranih problemov

problems.

Metode poučevanja in učenja:

predavanja, seminar, vaje, domače naloge, konzultacije in samostojno delo študentov

Learning and teaching methods:

Lectures, seminar, exercises, homework, consultations and independent work by the students

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Način:izpit iz vaj (2 kolokvija ali pisni izpit) or homework ustni izpit
Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)

50%

50%

Type:
exam of exercises (2 midterm exams or written exam) or homework

oral exam.

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

Reference nosilca / Lecturer's references:

Andrej Bauer:

BAUER, Andrej, STONE, Christopher A. RZ: a tool for bringing constructive and computable mathematics closer to programming practice. Journal of logic and computation, ISSN 0955-792X, 2009, vol. 19, no. 1, str. 17-43. [COBISS.SI-ID 15325785]

BAUER, Andrej, CLARKE, Edmund, ZHAO, Xudong. Analytica - An experiment in combining theorem proving and symbolic computation. Journal of automated reasoning, ISSN 0168-7433, 1998, vol. 21, no. 3, str. 295-325. [COBISS.SI-ID 10606425]

BAUER, Andrej, PETKOVŠEK, Marko. Multibasic and mixed hypergeometric Gosper-type algorithms. Journal of symbolic computation, ISSN 0747-7171, 1999, let. 28, št. 4-5, str. 711-736. [COBISS.SI-ID 9210969]

Sergio Cabello:

CABELLO, Sergio, KREVELD, Marc van. Approximation algorithms for aligning points. Algorithmica, ISSN 0178-4617, 2003, vol. 37, no. 3, str. 211-232. ,19,105,linkingpublicationresults,1:100117,1. [COBISS.SI-ID 13352793]

CABELLO, Sergio. Approximation algorithms for spreading points. *Journal of algorithms*, ISSN 0196-6774, 2007, vol. 62, no. 2, str. 49-73. [COBISS.SI-ID 14298201]

CABELLO, Sergio, HAVERKORT, Herman Johannes, KREVELD, Marc van, SPECKMANN, Bettina. Algorithmic aspects of proportional symbol maps. *Algorithmica*, ISSN 0178-4617, 2010, vol. 58, no. 3, str. 543-565. [COBISS.SI-ID 15151193]

Marko Petkovšek:

PETKOVŠEK, Marko. Counting Young tableaux when rows are cosets. *Ars combinatoria*, ISSN 0381-7032, 1994, let. 37, str. 87-95. [COBISS.SI-ID 8048473]

PETKOVŠEK, Marko, WILF, Herbert S., ZEILBERGER, Doron. *A=B*. Wellesley (Massachusetts): A. K. Peters, cop. 1996. VII, 212 str. ISBN 1-56881-063-6. [COBISS.SI-ID 4085337]

PETKOVŠEK, Marko. Letter graphs and well-quasi-order by induced subgraphs. *Discrete Mathematics*, ISSN 0012-365X. [Print ed.], 2002, vol. 244, no. 1-3, str. 375-388. [COBISS.SI-ID 11414873]