

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
Predmet:		Podatkovne strukture in algoritmi 3				
Course title:		Data structures and algorithms 3				
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:				M2613		
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. 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):		
Predavatelj izbere teme iz naslednjega seznama: Uravnotežena iskalna drevesa.				The lecturer chooses topics from the following list: Balanced search trees.		

Zgoščene tabele.	Hash tables.
Binomske in Fibonaccijeve kopice.	Binomial and Fibonacci heaps.
Vodenje disjunktnih množic.	Union-find for disjoint sets.
Algoritmi na nizih (Rabina in Karpa, Knutha, Morrisa in Pratta, Boyerja in Moora).	Algorithms for strings (Rabin and Karp, Knuth, Morris and Pratt, Boyer and Moore).
Računanje konveksne ovojnice.	Computation of convex hulls.
Voronojev diagram in Delauneyeva triangulacija.	Voronoi diagram and Delaunay triangulation.
Iskanje maksimalnega pretoka s predtokom.	Finding maximum flows with preflows.
Iskanje največjega (uteženega) prirejanja v splošnem grafu.	Finding largest (weighted) matchings in general graphs.
Algoritem alpha-beta.	Alpha-beta algorithm.
Algoritmi za ravninske grafe.	Algorithms for planar graphs.
Algoritmi za zunanji pomnilnik.	Algorithms for external memory.
Vztrajne podatkovne strukture.	Persistent data structures.
Podatkovne strukture za cela števila.	Data structures for integers.
Enostavni vzporedni algoritmi.	Simple parallel algorithms.
Dinamična drevesa.	Dynamic trees.

Temeljni literatura in viri / Readings:

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

D. C. Kozen: The Design and Analysis of Algorithms, Springer, 1991.

D. E. Knuth: Selected Papers on Analysis of Algorithms, Cambridge University Press, 2000.

S. Even, G. Even: Graph Algorithms, 2. izdaja, Cambridge University Press, 2011.

Znanstveni članki.

Cilji in kompetence:

Študent nadgradi poznavanje podatkovnih struktur in z njimi povezanih algoritmov, ki se uporabljajo pri načrtovanju učinkovitih algoritmov. Ob tem poglobi znanje o matematični analizi pravilnosti ter časovne in prostorske zahtevnosti algoritmov.

Objectives and competences:

The students improve their knowledge of data structures and related algorithmic techniques used in the design of efficient algorithms. They also develop the knowledge of mathematical analysis for the correctness and the time/space complexity of algorithms.

Predvideni študijski rezultati:

Znanje in razumevanje: Poznavanje zahtevnejših podatkovnih struktur in algoritmov, praktičnih in teoretičnih problemov, pri katerih se jih lahko smiselno uporabi, ter poznavanje osnov teorije računske zahtevnosti.

Uporaba: Snovanje učinkovitih računalniških programov in napovedovanje njihovega obnašanja v praksi s pomočjo matematičnih metod.

Refleksija: Povezanost med teoretičnimi napovedmi o obnašanju računalniških programov in dejanskim obnašanjem.

Prenosljive spretnosti – niso vezane le na en predmet: Pomen matematične analize računskih postopkov in njena praktična uporabnost. Ločevanje med računsko zahtevnimi in manj zahtevnimi problemi.

Intended learning outcomes:

Knowledge and understanding: Learning more about complex data structures and algorithms, practical and theoretical problems where this knowledge can be applied, and the basics of computational complexity. Application: The design of efficient computer programs and prediction of their behavior in practice by using mathematical methods. Reflection: The correlation between theoretical predictions about the behavior of computer programs and their actual behavior.

Transferable skills: The importance of mathematical analysis of computational processes and its practical application. Classification into difficult and less complex 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:	Weight (in %)	Assessment:
Način: izpit iz vaj (2 kolokvija ali pisni izpit) ali domače naloge, 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:

Sergio Cabello Justo:

- CABELLO, Sergio. Finding shortest contractible and shortest separating cycles in embedded graphs. V: 20th Annual ACM-SIAM Symposium on Discrete Algorithms, January 4-6, New York. SODA 2009 : special issue, (ACM transactions on algorithms, ISSN 1549-6325, Vol. 6, iss. 2). New York: Association for Computing Machinery, 2010, article No.: 24 (18 str.) [COBISS.SI-ID 15572057]
- CABELLO, Sergio. Many distances in planar graphs. Algorithmica, ISSN 0178-4617, 2012, vol. 62, no. 1-2, str. 361-381 [COBISS.SI-ID 15702873]
- CABELLO, Sergio, COLIN DE VERDIÈRE, Éric, LAZARUS, Francis. Algorithms for the edge-width of an embedded graph. V: 26th Annual Symposium on Computational Geometry, June 13th-16th, 2010, Snowbird, Utah. 26th Annual Symposium on Computation Geometry at Snowbird, Utah, USA : Special issue, (Computational geometry, ISSN 0925-7721, Vol. 45, iss. 5-6, 2012). Amsterdam: Elsevier, 2012, str. 215-224 [COBISS.SI-ID 16093017]