

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
Predmet:		Podatkovne strukture in algoritmi 1				
Course title:		Data structures and algorithms 1				
Študijski program in stopnja Study programme and level		Študijska smer Study field		Letnik Academic year	Semester Semester	
Univerzitetni študijski program Matematika		ni smeri		3	prvi	
First cycle academic study programme Mathematics		none		3	first	
Vrsta predmeta / Course type				izbirni		
Univerzitetna koda predmeta / University course code:				M0234		
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30		30			90	5
Nosilec predmeta / Lecturer:		doc. Alen Orbanić, prof. Sandi Klavžar, prof. Sergio Cabello Justo				
Jeziki / Languages:		Predavanja / Lectures:		slovenski/Slovene		
		Vaje / Tutorial:		slovenski/Slovene		
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:				Prerequisites:		
Vsebina:				Content (Syllabus outline):		

<ul style="list-style-type: none"> • Algoritmi, podatkovne strukture, časovna zahtevnost. • Tabela, sklad, vrsta, seznam. • Deli in vladaj: binarno iskanje, urejanje z zlivanjem, Strassenov algoritem, rešitev rekurzivnih enačb, hitro urejanje, mediana, itd. • Sestopanje. • Dinamično programiranje: najdaljše naraščajoče podzaporedje, Levenshteinova razdalja, množenje več matrik, 0/1-nahrbtnik, problem trgovskega potnika, itd. • Predstavitve grafov in omrežij. Osnovni algoritmi na grafih: pregledi, topološko urejanje, Floyd-Warshallov algoritem, Dijkstrov algoritem (kopice), Bellman-Fordov algoritem, itd. 	<ul style="list-style-type: none"> • Algorithms, data structures and time complexity • Arrays, stacks, queues and lists. • Divide and conquer: binary search, mergesort, Strassen's algorithm, solving recursive equations, Quicksort, median, and others. • Backtracking. • Dynamic programming: longest increasing subsequence, Levenshtein's distance, product of several matrices, 0/1-knapsack, travelling salesman problem, and others. • Representations of graphs and networks. Basic algorithms on graphs: traversals, topological sorting, Floyd-Warshall algorithm, Dijkstra's algorithm (heaps), Bellman-Ford algorithm, and others.
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Temeljni literatura in viri / Readings:

<p>T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein: Introduction to Algorithms, 2. izdaja, MIT Press, Cambridge, 2001.</p> <p>S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani: Algorithms, McGraw-Hill, 2008.</p> <p>J. Erickson: Zapiski za Undergraduate Algorithms, 2012.</p> <p>J. Kleinberg, E. Tardos: Algorithm design, Pearson/Addison-Wesley, 2005.</p> <p>J. Kozak: Podatkovne strukture in algoritmi, DMFA-založništvo, Ljubljana, 1997.</p>
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Cilji in kompetence:

<p>Študent spozna osnovne podatkovne strukture in z njimi povezane algoritme, ki se uporabljajo pri programiranju. Seznan se z matematično analizo pravilnosti ter časovne in prostorske zahtevnosti algoritmov.</p>
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Objectives and competences:

<p>The student gets familiar with data structures and related algorithms that are used in programming. It gets familiar with mathematical analysis of correctness, time and space complexity of algorithms.</p>

Predvideni študijski rezultati:

Intended learning outcomes:

<p>Znanje in razumevanje: Poznavanje nekaterih osnovnih podatkovnih struktur in algoritmov ter praktičnih problemov, pri katerih se jih lahko smiselno uporabi. Ugotavljanje pravilnosti računskih postopkov. Uporaba: Snovanje učinkovitih računalniških programov in napovedovanje njihovega obnašanja s pomočjo matematičnih metod.</p> <p>Refleksija: Povezanost med teoretičnimi napovedmi o obnašanju računalniških programov in njihovim dejanskim obnašanjem.</p> <p>Prenosljive spretnosti – niso vezane le na en predmet: Pomen matematične analize računskih postopkov in njena praktična uporabnost</p>	<p>Knowledge and understanding: Getting familiar with some basic data structures and algorithms, and some practical problems with relevant applications. Determining of correctness of computational procedures. Application: Design of efficient computer programs and forecasting of their behavior by using mathematical methods.</p> <p>Reflection: Connection between theoretical forecasts about behavior of computer programs and actual behavior.</p> <p>Transferable skills: The importance of mathematical analysis of computational procedures and its practical applicability</p>

Metode poučevanja in učenja:

<p>Predavanja, vaje, domače naloge, konzultacije</p>
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Learning and teaching methods:

<p>Lectures, exercises, homework, consultations</p>

Delež (v %) /

Weight (in %)

Načini ocenjevanja:

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt): Domače naloge z zagovorom</p> <p>2 kolokvija namesto izpita iz vaj, izpit iz vaj,</p> <p>izpit iz teorije</p> <p>ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project): homeworks with defense</p> <p>2 midterm exams instead of written exam, written exam</p> <p>oral exam</p> <p>grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)</p>
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Reference nosilca / Lecturer's references:

Sergio Cabello Justo:

- 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]
- CABELLO, Sergio, KNAUER, Christian. Algorithms for graphs of bounded treewidth via orthogonal range searching. *Computational geometry*, ISSN 0925-7721. [Print ed.], 2009, vol. 42, iss. 9, str. 815-824 [COBISS.SI-ID 15160409]
- 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]

Sandi Klavžar:

- BATAGELJ, Vladimir, KORENJAK-ČERNE, Simona, KLAVŽAR, Sandi. Dynamic programming and convex clustering. *Algorithmica*, ISSN 0178-4617, 1994, let. 11, št. 2, str. 93-103 [COBISS.SI-ID 6799364]
- KLAVŽAR, Sandi, LOKAR, Matija, PETKOVŠEK, Marko, PISANSKI, Tomaž. Izbrana poglavja iz računalništva. Del 2, Diskretna optimizacija, (Matematični rokopisi, 15). Ljubljana: Društvo matematikov, fizikov in astronomov SRS, 1986. 128 str [COBISS.SI-ID 13496065]
- KLAVŽAR, Sandi, MOLLARD, Michel. Cube polynomial of Fibonacci and Lucas cubes. *Acta applicandae mathematicae*, ISSN 0167-8019, 2012, vol. 117, no. 1, str. 93-105 [COBISS.SI-ID 16191833]
- ILIĆ, Aleksandar, KLAVŽAR, Sandi, RHO, Yoomi. Generalized Lucas cubes. *Applicable analysis and discrete mathematics*, ISSN 1452-8630, 2012, vol. 6, no. 1, str. 82-94 [COBISS.SI-ID 16242265]

Alen Orbanić:

- PERME, Tomaž, NOVAK, Matjaž, STRAŠEK, Rok, KAVKLER, Iztok, ORBANIĆ, Alen. A model for technical optimisation of the distribution centre, 2011, *Acta technica corviniensis*, tome 4, fasc. 2, str. 39-43 [COBISS.SI-ID 4154583]
- ORBANIĆ, Alen, BOBEN, Marko, JAKLIČ, Gašper, PISANSKI, Tomaž. Algorithms for drawing polyhedra from 3-connected planar graphs. *Informatica*, ISSN 0350-5596, 2004, vol. 28, no. 3, str. 239-243 [COBISS.SI-ID 13285977]
- ORBANIĆ, Alen. F -actions and parallel-product decomposition of reflexible maps. *Journal of algebraic combinatorics*, ISSN 0925-9899, 2007, issue 4, vol. 26, str. 507-527 [COBISS.SI-ID

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