

UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2016/17)						
<b>Predmet:</b>		Podatkovne strukture in algoritmi 2				
<b>Course title:</b>		Data structures and algorithms 2				
<b>Študijski program in stopnja</b> Study programme and level		<b>Študijska smer</b> Study field		<b>Letnik</b> Academic year		<b>Semester</b> Semester
Univerzitetni študijski program Matematika		ni smeri		3		drugi
First cycle academic study programme Mathematics		none		3		second
<b>Vrsta predmeta / Course type</b>				izbirni / elective		
<b>Univerzitetna koda predmeta / University course code:</b>				M0235		
<b>Predavanja</b> Lectures	<b>Seminar</b> Seminar	<b>Vaje</b> Tutorial	<b>Klinične vaje</b> work	<b>Druge oblike</b> študija	<b>Samost. delo</b> Individ. work	<b>ECTS</b>
30		30			90	5
<b>Nosilec predmeta / Lecturer:</b>		prof. dr. Sergio Cabello Justo, doc. dr. Alen Orbanic				
<b>Jeziki / Languages:</b>		<b>Predavanja / Lectures:</b>		slovenski / Slovene		
		<b>Vaje / Tutorial:</b>		slovenski / Slovene		
<b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>				<b>Prerequisites:</b>		
Vpis v letnik študija.				Enrolment in the programme.		
Opravljen predmet Podatkovne strukture in algoritmi 1.				Completed course Data structures and algorithms 1.		
<b>Vsebina:</b>				<b>Content (Syllabus outline):</b>		

<ul style="list-style-type: none"> <li>• Požrešna metoda: Huffmanovo kodiranje, pokritje množice, itd.</li> <li>• Amortizirana časovna zahtevnost. Disjunktna množice.</li> <li>• Minimalna vpeta drevesa. Boruvkav, Primov in Kruskalov algoritem.</li> <li>• Iskalna in uravnotežena drevesa.</li> <li>• Naključnostna iskalna drevesa. Preskakovalni sezname.</li> <li>• Zgoščanje.</li> <li>• Hitra Fourierova transformacija.</li> <li>• Primeri NP-težkih problemov. Splošne metode za težke probleme.</li> <li>• Drugi izbrani algoritmi.</li> </ul>	<ul style="list-style-type: none"> <li>• Greedy algorithms: Huffman codes, set cover, and others.</li> <li>• Amortized time complexity. Disjoint sets.</li> <li>• Minimum spanning tree. Boruvka's, Prim's and Kruskal's algorithm.</li> <li>• Balanced search trees.</li> <li>• Randomized search trees. Skip lists.</li> <li>• Hashing.</li> <li>• Fast Fourier transform.</li> <li>• Examples of NP-hard problems. Generic methods for hard problems.</li> <li>• Other selected algorithms.</li> </ul>
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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 nadgradi poznavanje osnovnih podatkovnih struktur in z njimi povezanih algoritmov, 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 upgrades the knowledge about basic data structures and related algorithms that are used at programming. It gets familiar with mathematical analysis of correctness, time and space complexity of algorithms.</p>
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#### **Predvideni študijski rezultati:**

#### **Intended learning outcomes:**

Znanje in razumevanje: Poznavanje osnovnih podatkovnih struktur in algoritmov ter praktičnih problemov, pri katerih se jih lahko smiselno uporabi. Poznavanje osnov teorije računske zahtevnosti in razumevanje njenega pomena v praksi.

Uporaba: Snovanje učinkovitih računalniških programov in napovedovanje njihovega obnašanja 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 obvladljivimi in neobvladljivimi problemi.

Knowledge and understanding: Knowledge about basic data structures and algorithms, as well as practical problems with relevant applications. Knowledge about basics of theory of computational complexity and understanding its meaning in practice.

Application: Designing efficient computer programs and predicting their behavior by using mathematical methods.

Reflection: Connection between theoretical predictions about behavior of computer programs and actual behavior.

Transferable skills: Meaning of mathematical analysis of computational procedures and its practical applicability. Distinction between manageable and unmanageable problems.

#### Metode poučevanja in učenja:

Predavanja, vaje, domače naloge, konzultacije

#### Learning and teaching methods:

Lectures, exercises, homework, consultations

#### Načini ocenjevanja:

Delež (v %) /

Weight (in %)

#### Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

50%

Type (examination, oral, coursework, project):

Domače naloge z zagovorom kolokvija namesto izpita iz vaj, izpit iz vaj,

50%

homeworks with defense

izpit iz teorije

2 midterm exams instead of written exam, written exam

ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)

Exam of theory

		grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)
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**Reference nosilca / Lecturer's references:**

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, 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, 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]

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. 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 14429529]

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]