

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Algoritmi v računalništvu
Course title: Algorithms in Computer Science

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Računalništvo in spletne tehnologije, visokošolski strokovni študijski program prve stopnje	-	Drugi ali tretji	Četrtri ali šesti
Computer Science and Web Technologies, first cycle Professional Study Programme	-	Second or third	Fourth or sixth

Vrsta predmeta / Course type

Izbirni / Elective

Univerzitetna koda predmeta / University course code:

2-RST-VS-IP-AR-2020-05-14

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	-	45	-	-	105	6

Nosilec predmeta / Lecturer:

izr. prof. dr. Zoran Levnajić, izr. prof. dr. Biljana Mileva Boshkoska

Jeziki / Languages:**Predavanja / Lectures:** Slovenski / Slovenian, Angleški / English**Vaje / Tutorial:** Slovenski / Slovenian, Angleški / English**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

Pogoj za vključitev v delo je vpis v 1. letnik študija, ustrežna prisotnost na vajah in zagovorjena seminarska naloga.

Prerequisites:

Enrolment into the first year of the study programme, appropriate presence during the lab work and finished student project.

Vsebina:

Podatkovne strukture:

- B-drevesa,
- Fibonacci kopice
- Grafi

Algoritmi:

- testiranje pravilnosti algoritmov
- ocenjevanje časovne in prostorske zahtevnosti
- algoritmi na grafih

Content (Syllabus outline):

Data structures:

- B-trees
- Fibonacci heaps
- Graphs

Algorithms:

- testing algorithms for correctness
- estimating time and space complexity
- graph algorithms

- Večnitni algoritmi (vzporedno računanje)
- Požrešni algoritmi (Huffmanovo kodiranje)
- Dinamično programiranje

- Multi thread algorithms (parallel execution)
- Greedy algorithms (Huffmans encoding)
- Dynamic programming

Temeljni literatura in viri / Readings:

- Cormen, T. H., Leiserson, C. E., Rivest, R. L. & Stein, C. (2009). *Introduction to Algorithms* (3rd ed.). Cambridge: MIT Press.
- Roughgarden, T. (2018). *Algorithms Illuminated (Part 3): Greedy Algorithms and Dynamic Programming*.
- Knuth, D. E. (1997). *The Art of Computer Programming, Volume 1, Fundamental Algorithms* (3rd ed.).

Cilji in kompetence:

Učna enota prispeva k razvoju naslednjih splošnih in predmetno-specifičnih kompetenc:

Splošne kompetence:

- poznavanje osnov računalništva in informacijske tehnologije
- usposobljenost za izvajanje vseh faz razvoja računalniških aplikacij: načrtovanje, razvoj, zagon, prodaja, vzdrževanje

Predmetno-specifične kompetence:

- poznavanje osnovnih podatkovnih struktur in računalniških algoritmov
- sposobnost samostojnega reševanja realnih problemov z uporabo primernih podatkovnih struktur in algoritmov

Objectives and competences:

The instructional unit contributes to the development of the following general and subject-specific competences:

General competences:

- familiarity with the basics of computer science and information technology
- competence to carry out all phases in the development of computer applications: planning, development, start-up, sales, maintenance

Subject-specific competences:

- familiarity with basic data structures and computer algorithms
- ability to independently solve real problems by using adequate data structures and algorithms

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent/študentka:

- razvije sposobnost logičnega razmišljanja in reševanja problemov z uporabo standardnih podatkovnih struktur in algoritmov

Intended learning outcomes:

Knowledge and understanding:

The student:

- develops the ability of logical thinking and problem solving with the use of standard data structures and algorithms

Metode poučevanja in učenja:

- predavanja z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov)
- vaje, kjer bodo študentje na konkretnih problemih ponovili, utrdili in dodatno osvetlili pojme in metode, spoznane na predavanjih
- kolokviji: z njimi bodo študentje stimulirani, da sproti študirajo snov, ki bo obravnavana na predavanjih in vajah

Learning and teaching methods:

- lectures with active student participation (explanation, discussion, questions, examples, problem solving)
- lab work, during which the students will use practical problems to repeat and strengthen the topics and methods presented at the lectures
- midterm exams will stimulate the students to study concurrently with lectures and lab work

Načini ocenjevanja:

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

- pisni izpit
- vaje

Delež (v %) /

Weight (in %) /

Assessment:

Type (examination, oral, coursework, project):

- written exam
- lab work

Reference nosilca / Lecturer's references:

izr. prof. dr. Zoran Levnajić:

- Crnkić, J. Povh, V. Jaćimović, Z. Levnajić, Collective dynamics of phase-repulsive oscillators solves graph coloring problem, *Chaos* 30, 033128, 2020
- M. Faggian, F. Ginelli, F. Rosas, Z. Levnajić, Synchronization in time-varying random networks with vanishing connectivity, *Scientific Reports* 9, 10207, 2019.
- M. Grau Leguía, R. G. Andrzejak, Z. Levnajić, Evolutionary optimization of network reconstruction from derivative-variable correlations, *Journal of Physics A: Mathematical and Theoretical* 50, 334001, 2017.
- L. Šubelj, M. Bajec, A. Kastrin, B. Mileva Boshkoska, Z. Levnajić, Quantifying the Consistency of Scientific Databases, *PLoS ONE* 10, e0127390, 2015.
- O. N. Yaveroglu, N. Malod-Dognin, D. Davis, Z. Levnajić, V. Janjić, R. Karapandža, A. Stojmirović, N. Pržulj, Revealing the Hidden Language of Complex Networks, *Scientific Reports* 4,4547, 2014.

izr. prof. dr. Biljana Mileva Boshkoska:

- MILEVABOSHKOSKA, Biljana, BOHANEĆ, Marko, BOŠKOSKI, Pavle, JURIČIĆ, Đani. Copula based decision support system for quality ranking in the manufacturing of electronically commutated motors. *Journal of intelligent manufacturing*, 2015, vol. 26, no. 2, str. 281 – 293.
- MILEVA BOSHKOSKA, Biljana, BOŠKOSKI, Pavle, DEBENJAK, Andrej, JURIČIĆ, Đani. Dependence among complex random variables as a fuel cell condition indicator. *Journal of power sources*, jun. 2015, vol. 284, str. 566-573.
- MILEVA BOSHKOSKA, Biljana, LIU, Shaofeng, ZHAO, Guoqing, FERNANDEZ, Alejandro, GAMBOA, Susana, PINO, Mariana del, ZARATÉ, Pascale, HERNANDEZ, Jorge, CHEN, Huilan. A decision support system for evaluation of the knowledge sharing crossing boundaries in agri-food value chains. *Computers in industry*, 2019, vol. 110, str. 64-80.
- ZHAO, Guoqing, LIU, Shaofeng, LOPEZ, Carmen, LU, Haiyan, ELGUETA, Sebastian, CHEN, Huilan, MILEVA BOSHKOSKA, Biljana. Blockchain technology in agri-food value chain management : a synthesis of applications, challenges and future research directions. *Computers in industry*, 2019, vol. 109, str. 83-99.