UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Uvod v algoritme
Course title:	Introduction to Algorithms

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	-	Prvi	Prvi
Computer Science and Web Technologies, first cycle Professional Study Programme	-	First	First

Vrsta predmeta / Course type Obvezni / Obligatory

Univerzitetna koda predmeta / University course code: 2-RST-VS-UA-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. 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, ustrezna prisotnost na vajah in zagovorjena seminarska naloga.

Prerequisits:

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

Vsebina:

Content (Syllabus outline):

Vloga algoritmov v računalništvu

- Pregled algoritmov in njihovo mesto v sodobnih računalniških sistemih.
- Definicija algoritma in primeri.
- Algoritmi kot tehnologija (njihova uporaba v strojni opremi, grafičnih uporabniških vmesnikih, objektno orientiranih sistemih in omrežjih).

Uvedba osnovnih algoritemskih pristopov v psevdo jeziku

- Določitev vhodov in izhodov v algoritmu.
- For zanke.
- While zanke.
- If then pravila odločanja.

Predstavitev osnovnih podatkovnih struktur in algoritmov za delo z njimi

- Tabele.
- Seznami.
- Skladi.
- Kopice.

Predstavitev funkcij preko algoritmov

- Prvi algoritem, ki rešuje problem sortiranja zaporedja od *n* številk z uporabo psevdokoda.
- Definiranje strukture algoritma, tako da ga lahko študent/študentka uporabi v jeziku po svoji izbiri.
- Uvod v tehnike iskanja: Linearno, binarno in interpolacijsko iskanje, razprčeno izkanje
- Dva različna tipa algoritmov za sortiranje(razvrščanje): pojasnjuje postopen pristop s pomočjo vstavitve vrste in rekurzivna tehnika z zlivanjem, "deli in vladaj". Drugi algoritmi za sortiranje: sortiranje z izbiranjem, Shellovo razvrščanje, hitro razvrščanje.
- Naučiti se, kako izračunati čas izvršitve algoritmov, ko se vrednost n povečuje,
- Razviti koristen zapis, ki izrazi časovno izvedbo algoritmov.

The Role of Algorithms in Computing

- Overview of algorithms and their place in modern computing systems.
- Defenition of algorithm and examples.
- Algorithmes as technology (their usage in hardware, graphical user interfaces, objectoriented systems, and networks).

Introduction of basic algorithmic approaches in pseudo language

- Define inputs and outputs in the algorithm.
- For loops.
- While loops.
- If then decision rules.

Introduction of basic data structures and algorithms with them

- Tables.
- Lists.
- Stacks.
- Heaps.

Function representation and their growth with algorithms

- A first algorithm that solves the problem of sorting a sequence of n numbers using pseudocode.
- Explaining the structure of the algorithm so that a student can implement it in the language of his/hers choice.
- Introduction to searching algorithms: linear serch, binary search, interpolation search, hush search
- Diferent sorting algorithms: explaining the incremental approach through insertion sort, and a recursive technique through merge sort, "divide and conquer." Other covered sorting algorithms: selection sort, Shell sort, quick sort.
- Learn how to calculate the execution time of the algorithms when the value of n increases, Develop a useful notation to express the time execution of algorithms.

Temeljni literatura in viri / Readings:

- Cormen, T. H., Leiserson, C. E., Rivest, R. L. & Stein, C. (2009). *Introduction to Algorithms* (3rd ed.). The MIT Press.
- Kononenko, I. & sod. (2008). *Programiranje in algoritmi*. Založba FE in FRI.
- Knuth, D. (1997). *The Art of Computer Programming, Volume 1, Fundamental Algorithms* (3rd ed.). Addison Wesley Longman Publishing Co., Inc.

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

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

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt): • pisni izpit	100	Type (examination, oral, coursework, project): • written exam

Reference nosilca / Lecturer's references:

- 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, ISSN 0166-3615. [Print ed.], 2019, vol. 109, str. 83-99.
- MILEVA BOSHKOSKA, Biljana, LIU, Shaofeng, ZHAO, Guoqing, FERNANDEZ, Alejandro, GAMBOA, Susana, PINO, Mariana del, ZARATÉ, Pascale, HERNANDÉZ, Jorge, CHEN, Huilan. A decision support system for evaluation of the knowledge sharing crossing boundaries in agri-food value chains. Computers in industry, ISSN 0166-3615. [Print ed.], 2019, vol. 110, str. 64-80.
- GRAŠIČ, Valerij, KOS, Andrej, MILEVA BOSHKOSKA, Biljana. Classification of incoming calls for the capital city of Slovenia smart city 112 public safety system using open Internet of Things data. International journal of distributed sensor networks, ISSN 1550-1477. [Online ed.], 2018, vol. 14, no. 9, str. 1-12,
- MILEVA BOSHKOSKA, Biljana, BOHANEC, 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,