

**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
Informatika v sodobni družbi, visokošolski strokovni študijski program prve stopnje	-	Prvi	Prvi
Informatics in Contemporary Society, first cycle Professional Study Programme	-	First	First

**Vrsta predmeta / Course type**

Obvezni / Obligatory

**Univerzitetna koda predmeta / University course code:**

1-ISD-VS-UA-2025-12-04

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

**Nosilec predmeta / Lecturer:** 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.

**Prerequisites:**

Enrolment into the first year of the study programme.

**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.
- Sezname.
- Skladi.
- Kopice.

### Predstavitev funkcij preko algoritmov

- Prvi algoritem, ki rešuje problem sortiranja zaporedja od  $n$  števil 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, razpršeno iskanje
- 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.
- Definition of algorithm and examples.
- Algorithms as technology (their usage in hardware, graphical user interfaces, object oriented 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/her choice.
- Introduction to searching algorithms: linear search, binary search, interpolation search, hash search
- Different 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): <ul style="list-style-type: none"> <li>• pisni izpit</li> </ul>	100	Type (examination, oral, coursework, project): <ul style="list-style-type: none"> <li>• written exam</li> </ul>

**Reference nosilca / Lecturer's references:**

<ul style="list-style-type: none"> <li>• 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. <i>Computers in industry</i>, ISSN 0166-3615. [Print ed.], 2019, vol. 109, str. 83-99.</li> <li>• 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. <i>Computers in industry</i>, ISSN 0166-3615. [Print ed.], 2019, vol. 110, str. 64-80.</li> <li>• 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. <i>International journal of distributed sensor networks</i>, ISSN 1550-1477. [Online ed.], 2018, vol. 14, no. 9, str. 1-12,</li> <li>• MILEVA BOSHKOSKA, Biljana, BOHANEC, Marko, BOŠKOSKI, Pavle, JURičIĆ, Đani. Copula based decision support system for quality ranking in the manufacturing of electronically commutated motors. <i>Journal of intelligent manufacturing</i>, 2015, vol. 26, no. 2, str. 281 - 293</li> <li>• MILEVA BOSHKOSKA, Biljana, BOŠKOSKI, Pavle, DEBENJAK, Andrej, JURičIĆ, Đani. Dependence among complex random variables as a fuel cell condition indicator. <i>Journal of power sources</i>, jun. 2015, vol. 284, str. 566-573,</li> </ul>
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