



## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Osnove algoritmov
<b>Course title:</b>	Introduction to algorithms

Izobraževalni program in stopnja Educational programme and level	Študijska smer Study field	Akademsko leto Academic year
NOO projekt piloti: Naprednejša računalniška znanja (nivo: visokošolski strokovni študijski program)	Digitalizacija, internet stvari ter industrijska avtomatizacija	2024/25
RRP pilot project: Advanced computer skills (level: first cycle professional study programme)	Digitalization, Internet of Things, and Industrial Automation	2024/25

**Vrsta predmeta / Course type**

Obvezni / Obligatory

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

NOO-DISIA-VS-OA-2024-25

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
15	/	15	/	/	60	3

**Nosilec predmeta / Lecturer:** prof. dr. Biljana Mileva Boshkoska

**Jeziki / Languages:**

**Predavanja / Lectures:** Slovenski / Slovenian, Angleški / English

**Vaje / Tutorials:** Slovenski / Slovenian, Angleški / English

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

Vpis v polletni izobraževalni program, smer Digitalizacija, internet stvari ter industrijska avtomatizacija.

**Prerequisites:**

Enrollment in the six-month educational programme, field Digitization, Internet of Things and Industrial Automation.

**Vsebina:**

Vloga algoritmov v računalništvu

- Pregled algoritmov in njihovo mesto v sodobnih računalniških sistemih.
- Definicija algoritma in primeri.

**Content (Syllabus outline):**

The Role of Algorithms in Computing

- Overview of algorithms and their place in modern computing systems.
- Definition of algorithm and examples.



- 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.

Algoritmi iskanja in razvrščanja

- Primer algoritma za razvrščanje v psevdo kodi.
- Definiranje strukture algoritma, tako da se ga lahko uporabi v jeziku po svoji izbiri.
- Uvod v tehnike iskanja algoritmov
- Različni tipi algoritmov za sortiranje (razvrščanje).
- Čas izvršitve algoritmov.
- Zapis, ki izrazi časovno izvedbo algoritmov.

- 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.

Searching and sorting algorithms

- An example of sorting algorithm in pseudocode.
- Defining the algorithm's structure so that can be implemented it in the language of choice.
- Introduction to searching algorithms.
- Different sorting algorithms.
- Time execution of algorithms.
- 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:**

**Objectives and competences:**



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

*Splošne kompetence:*

- poznavanje osnov računalništva in informacijske tehnologije.

*Predmetno-specifične kompetence:*

- poznavanje osnovnih podatkovnih struktur in računalniških algoritmov,
- sposobnost samostojnega reševanja realnih problemov z uporabo primernih podatkovnih struktur in algoritmov,
- razumevanje razlik med osnovnimi algoritmi iskanja in razvrščanja v računalništvu.

*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.

*Subject-specific competences:*

- familiarity with basic data structures and computer algorithms,
- ability to independently solve real problems by using adequate data structures and algorithms,
- understanding the differences among basic searching and sorting algorithms in computer science.

#### **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),
- exercises, during which the students will use practical problems to repeat and strengthen the topics and methods presented at the lectures.



Delež (v %) /

Weight (in %)

Assessment:

**Načini ocenjevanja:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt):	Delež (v %) / Weight (in %)	Assessment: Type (examination, oral, coursework, project):
<ul style="list-style-type: none"><li>pisni izpit</li></ul>	100	<ul style="list-style-type: none"><li>written exam</li></ul>

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

1. ANDONOVIKJ, Viktor, BOŠKOSKI, Pavle, DŽEROSKI, Sašo, BOSHKOSKA, Biljana Mileva. Survival analysis as semi-supervised multi-target regression for time-to-employment prediction using oblique predictive clustering trees. Expert systems with applications. Aug. 2023, 121246, pp. 1-23, ilustr. ISSN 1873-6793.
2. ANDONOVIKJ, Viktor, BOŠKOSKI, Pavle, EVKOSKI, Bojan, REDEK, Tjaša, BOSHKOSKA, Biljana Mileva. Community analysis in Slovenian labour network 2010-2020. Journal of decision systems. 2022, vol. 31, suppl. 1, pp. 308-318. ISSN 1246-0125.
3. HAJNIĆ, Miljenko, BOSHKOSKA, Biljana Mileva. A disruptive decision support platform for reengineering the strategic transfer of employees. IEEE access. 2021, vol. 9, pp. 29921-29928. ISSN 2169-3536.
4. BOŠKOSKI, Pavle, PERNE, Matija, RAMEŠA, Martina, BOSHKOSKA, Biljana Mileva. Variational Bayes survival analysis for unemployment modelling. Knowledge-based systems. [Print ed.]. 11 Oct. 2021, vol. 229, [article no.] 107335, pp. 1-11, ISSN 0950-7051.
5. KUNIĆ, Zdravko, ŽENKO, Bernard, BOSHKOSKA, Biljana Mileva. FOCUSED-short-term wind speed forecast correction algorithm based on successive nwp forecasts for use in traffic control decision support systems. Sensors. 2021, vol. 21, no. 10, pp. 3405-1-3405-17.
6. BOSHKOSKA, Biljana Mileva, MILJKOVIĆ, Dragana, VALMARSKA, Anita, GATSIOS, Dimitros, RIGAS, George, KONITSIOTIS, Spyros, TSIOURIS, Kostas M., FOTIADIS, Dimitrios I., BOHANEC, Marko. Decision support for medication change of Parkinson's disease patients. Computer methods and programs in biomedicine. [Print ed.]. 2020, vol. 196, pp. 105552-1-105552-15.