

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Uvod v algoritme
<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)	Programiranje in razvoj aplikacij	2024/25
RRP pilot project: Advanced computer skills (level: first cycle professional study programme)	Programming and application development	2024/25

### Vrsta predmeta / Course type

Obvezni / Obligatory

### Univerzitetna koda predmeta / University course code:

NOO-PRA-VS-UA-2024-25

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	/	30	/	/	120	6

### Nosilec predmeta / Lecturer:

viš. pred. dr. Albert Zorko

### 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 osvojitve predmetnih vsebin Uvoda v informatiko.

### Prerequisites:

The prerequisite is mastering the subject content of the Introduction to informatics.

### Vsebina:

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).

### Content (Syllabus outline):

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).

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  $n$  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.

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 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

<b>Načini ocenjevanja:</b>	Delež (v %) / Weight (in %)	<b>Assessment:</b>
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:**

- Zorko, A. (2020). Modelling human cardiorespiratory system through heart-rate variability: doctoral dissertation [[A. Zorko]]. <http://revis.openscience.si/lzpisGradiva.php?id=6866>
- Zorko, A., Frühwirth, M., Goswami, N., Moser, M., & Levnajić, Z. (2020). Heart rhythm analyzed via shapelets distinguishes sleep from awake. *Frontiers in Physiology*, 10, 1–16. doi:10.3389/fphys.2019.01554
- Zorko, A., & Levnajić, Z. (2017). Data analysis of hearth-rate variability. In B. Rodič (Ed.), *Book of Abstracts* (p. 12). Faculty of Information Studies. <http://itis.fis.unm.si/>
- Zorko, A., & Levnajić, Z. (2018). Precise measurement of heart rate dynamics distinguishing sleep from awake for man and woman. In A. Hafner & Z. Levnajić (Eds.), *Book of Abstracts* (p. 13). Faculty of Information Studies. <http://itis.fis.unm.si/wp-content/uploads/2018/10/ITIS2018-Proceedings.pdf>
- Zorko, A., Murtič, S., Milanovič, S., & Uhernik, I. (2022). Possible forms of management and administration of intelligent systems in industrial logistics. *International Journal of Regional Development*, 3, 155–182. [https://www.arena.si/Files/Images/2052/IJRD\\_vol.\\_3.pdf](https://www.arena.si/Files/Images/2052/IJRD_vol._3.pdf)