UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Uvod v algoritme
Course title:	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	2023/24
RRP pilot project: Advanced computer skills (level: first cycle professional study programme)	Programming and application development	2023/24

Vrsta predmeta / Course type | Obvezni / Obligatory

Univerzitetna koda predmeta / University course code: | NOO-PRA-VS-UA-2023-24

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:

Prerequisits:

Pogoj za vključitev v delo je osvojitev predmetnih vsebin Uvoda v informatiko.

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 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, 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 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:

- Zorko, A. (2020). Modelling human cardiorespiratory system through heart-rate variability: doctoral dissertation [[A. Zorko]]. http://revis.openscience.si/IzpisGradiva.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.arema.si/Files/Images/2052/IJRD_vol._3.pdf