



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Algoritmi in podatkovne strukture
Course title:	Algorithms and data structures

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj	/	2.	4.
Five-year master's degree program Subject Teacher	/		

Vrsta predmeta / Course type:

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			45		120	7

Nosilec predmeta / Lecturer:

Jeziki / Languages: Predavanja / Lectures:
Vaje / Tutorial:

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

Vsebina: Content (Syllabus outline):

Analiza algoritma: časovna in prostorska zahtevnost.

Osnovne podatkovne strukture in njihov pomen: sklad, vrsta in povezani seznam.

Drevesa: dvojiško drevo, predstavitev in pregled. Kopica in vrsta s prednostjo.

Dvojiška iskalna drevesa,

Algoritmično reševanje problemov: primeri problemov in načini reševanja.

Strategije razvoja algoritmov: deli in vladaj, požrešna metoda, dinamično programiranje, sestopanje.

Algorithm analysis: time in space complexity.

Elementary data structures: stack, queue and linked list.

Trees: binary tree, implementation and traversal. Heap and priority queue.

Binary search trees.

Algorithmic problem solving: examples of problems and methods of solving.

Algorithmic strategies: divide and conquer, greedy algorithms, dynamic programming, backtracking.

Temeljna literatura in viri / Readings:

K. Mehlkor, P. Sanders, Algorithms and data structures : the basic toolbox, Springer, 2008.

J. Kozak, Podatkovne strukture in algoritmi, Ljubljana, DMFA, 1997.

D. Harel, Y. Feldman, Algorithmics: the spirit of computing, AddisonWesley : Pearson Education, 2004.

M.A. Weiss, Data structures and algorithms analysis, The Benjamin/Cummings Publishing Company, 1995.

A. Shen, Algorithms and programming: problems and solutions, Springer, 2010.

Cilji in kompetence:

- Spoznati osnove algoritmičnega reševanja problemov.
- Spoznati temeljne koncepte podatkovnih struktur in njihovo uporabo.
- Spoznati osnovne strategije snovanja algoritmov.

Objectives and competences:

- Know basic concepts from algorithmic problem solving.
- Know fundamental concepts of data structures and their applications.
- Know basic algorithm design techniques.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Zmožnost uporabe osnovnih in zahtevnejših podatkovnih struktur.
- Prepoznati vpliv izbire podatkovne strukture na zahtevnost algoritma pri različnih praktičnih aplikacijah.
- Razumevanje principov analize algoritmov.

Intended learning outcomes:

Knowledge and understanding:

- Ability to apply elementary and advanced data structures.
- To recognize the influence of data structure to algorithm complexity in practical applications.
- To understand principles of algorithm analysis.

<ul style="list-style-type: none"> Razumeti pomen strategij snovanja algoritmov. <p>Prenosljive/ključne spretnosti in drugi atributi:</p> <ul style="list-style-type: none"> Prenos znanja algoritmičnega razmišljanja na sorodna oziroma povezana področja (diskretna matematika, biologija, kemija...) 	<ul style="list-style-type: none"> To understand the meaning of algorithm design. <p>Transferable/Key Skills and other attributes:</p> <ul style="list-style-type: none"> Knowledge transfer of algorithmic thinking into other fields (discrete mathematics, biology, chemistry, ...)
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Metode poučevanja in učenja:

<ul style="list-style-type: none"> Predavanja Seminar Računalniške in teoretične vaje
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Learning and teaching methods:

<ul style="list-style-type: none"> Lectures Seminary work Computer and theoretical exercises

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
<u>Sprotno preverjanje:</u>		<u>Mid-term testing:</u>
Domače naloge	20%	Homework
Seminar	20%	Seminary work
<u>Izpit:</u>		<u>Exams:</u>
Pisni izpit – problemi	30%	Written exam – problems
Pisni izpit – teorija	30%	Written exam – theory
Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.		Each of the mentioned assessments must be assessed with a passing grade.
Opravljene sprotne obveznosti so pogoj za pristop k pisnemu izpitu – problemi.		Passing grades of all mid-term testings are required for taking the written exam – problems. Passing grade of written exam – problems is required to take the written exam – theory.
Opravljen pisni izpit – problemi je pogoj za pristop k pisnemu izpitu – teorija.		

Reference nosilca / Lecturer's references:

<ol style="list-style-type: none"> KORŽE, Danilo, MARKUŠ, Žiga, VESEL, Aleksander. A heuristic approach for searching (d,n)-packing colorings of infinite lattices. <i>Discrete applied mathematics</i>, ISSN 0166-218X. [Print ed.], March 2019, vol. 257, str. 353-358. https://doi.org/10.1016/j.dam.2018.09.018, [COBISS.SI-ID 21821462]. KORŽE, Danilo, VESEL, Aleksander. Packing coloring of generalized Sierpiński graphs. <i>Discrete mathematics and theoretical computer science</i>, ISSN 1365-8050, 2019, vol. 21, no. 3, str. 1-18. https://dmtcs.episciences.org/5178/pdf. [COBISS.SI-ID 22126870].

3. VESEL, Aleksander. Cube-complements of generalized Fibonacci cubes. *Discrete Mathematics*, ISSN 0012-365X. [Print ed.], April 2019, vol. 342, iss. 4, str. 1139-1146.
<https://doi.org/10.1016/j.disc.2019.01.008>, [COBISS.SI-ID [18539097](#)].
4. SHAO, Zehui, VESEL, Aleksander, XU, Jin. The k-distance independence number and 2-distance chromatic number of Cartesian products of cycles. *Bulletin of the Malaysian Mathematical Society*, ISSN 0126-6705, 2018, vol. 41, iss. 3, str. 1377-1391, doi: [10.1007/s40840-016-0397-0](https://doi.org/10.1007/s40840-016-0397-0). [COBISS.SI-ID [22601992](#)].
5. KORŽE, Danilo, VESEL, Aleksander. (d,n)-packing colorings of infinite lattices. *Discrete applied mathematics*, ISSN 0166-218X. [Print ed.], March 2018, vol. 237, str. 97-108, doi: [10.1016/j.dam.2017.11.036](https://doi.org/10.1016/j.dam.2017.11.036). [COBISS.SI-ID [21067542](#)].