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 Obvezni / Obligatory

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
30	15		45		120	7

Nosilec predmeta / Lecturer: Red. prof. dr. Aleksander Vesel

Jeziki / **Languages:**	**Predavanja /** **Lectures:**	Slovenski/Slovenian
	Vaje / Tutorial:	Slovenski/Slovenian

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

Jih ni.

Prerequisits:

There are none.

Vsebina:

Content (Syllabus outline):

Analiza algoritma: časovna in prostorska zahtevnost.	Algorithm analysis: time in space complexity.
Osnovne podatkovne strukture in njihov pomen: sklad, vrsta in povezani seznam.	Elementary data structures: stack, queue and linked list.
Drevesa: dvojiško drevo, predstavitev in pregled. Kopica in vrsta s prednostjo.	Trees: binary tree, implementation and traversal. Heap and priority queue.
Dvojiška iskalna drevesa,	Binary search trees.
Algoritmično reševanje problemov: primeri problemov in načini reševanja.	Algorithmic problem solving: examples of problems and methods of solving.
Strategije razvoja algoritmov: deli in vladaj, požrešna metoda, dinamično programiranje, sestopanje.	Algorithmic strategies: divide and conquer, greedy algorithms, dynamic programming, backtracking.

Temeljni 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 theri 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 stuctures.
- To recognize the influence of data structure to algorithm complexity in practical applications.
- To understand principles of algorithm analysis.

• Razumeti pomen strategij snovanja algoritmov.		• To understand the meaning of algorithm design.
Prenesljive/ključne spretnosti in drugi atributi:		Transferable/Key Skills and other attributes:
• Prenos znanja algoritmičnega razmišljanja na sorodna oziroma povezana področja (diskretna matematika, biologija, kemija...)		• Knowledge transfer of algorithmic thinking into other fields (discrete mathematics, biology, chemistry, …)

Metode poučevanja in učenja:

Metode poučevanja in učenja:	Learning and teaching methods:
• Predavanja • Seminar • Računalniške in teoretične vaje	• Lectures • Seminary work • Computer and theoretical exercises

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Sprotno preverjanje:		Mid-term testing:
Domače naloge	20%	Homework
Seminar	20%	Seminary work
Izpit:		Exams:
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. Opravljen pisni izpit – problemi je pogoj za pristop k pisnemu izpitu – teorija.		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.

Reference nosilca / Lecturer's references:

1. KORŽE, Danilo, MARKUŠ, Žiga, VESEL, Aleksander. A heuristic approach for searching (d,n)-packing colorings of infinite lattices. *Discrete applied mathematics*, 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].

2. KORŽE, Danilo, VESEL, Aleksander. Packing coloring of generalized Sierpiński graphs. *Discrete mathematics and theoretical computer science*, 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. [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. [COBISS.SI-ID 21067542].