



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Algoritmi
Course title:	Algorithms

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika, 1. stopnja		2.	4.
Mathematics, 1 st cycle		2.	4.

Vrsta predmeta / Course type

Obvezni / Compulsory

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		15	30		120	7

Nosilec predmeta / Lecturer:

Aleksander VESEL

**Jeziki /
Languages:**

**Predavanja /
Lectures:**

SLOVENSKO/SLOVENE

Vaje / Tutorial:

SLOVENSKO/SLOVENE

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

Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno.
Pozitivne ocene pri kolokvijih in sprotnih nalogah so pogoj za pristop k pisnemu izpitu.

Vsebina:

Analiza algoritma: časovna in prostorska zahtevnost.

Deli in vladaj: bisekcija, urejanje (hitro urejanje, urejanje z zlivanjem), iskanje k -tega najmanjšega elementa v zaporedju, množenje velikih števil, množenje matrik.

Prerequisites:

Each of the mentioned assessments must be assessed with a passing grade.
Passing grades for midterm exams and coursework are required for taking the written exam.

Content (Syllabus outline):

Algorithm analysis: time and space complexity.

Divide and conquer: bisection, sorting (quick sort, merge sort), selection problem, big numbers multiplication, matrix multiplication.

Požrešna metoda: preprosti problem nahrbtnika, minimalno vpeto drevo, drevo najkrajših poti, Huffmanovo kodiranje. Dinamično programiranje: dolžine najkrajših poti v grafu, 0/1 nahrbtnik, problem trgovskega potnika. Sestopanje: barvanje grafa, problem n kraljic, igre za dva igralca, α-β obrezovanje. Verjetnostni algoritmi: primeri verjetnostnih algoritmov, npr. testiranje praštevilstva.	Greedy algorithms: fractional knapsack problem, minimum spanning tree, single-source shortest path in a graph, Huffman codes. Dynamic programming: all-pairs shortest paths in a graph, 0/1 knapsack problem, traveling salesman problem. Backtracking: graph coloring, n-queens on a chessboard, strategic games, α-β pruning. Randomized algorithms: examples of randomized algorithms, e.g. primality testing.
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Temeljni literatura in viri / Readings:

J. Kozak, Podatkovne strukture in algoritmi, Ljubljana, DMFA, 1997.
T. H. Cormen, C. E. Leiserson, R.L. Rivest, Introduction to algorithms, The MIT Press, 2022.
S.S. Skiena, The Algorithm Design Manual, Springer, 2020.
S. Dasgupta, C. H. Papadimitriou, U. V. Vazirani, Algorithms, McGraw-Hill, 2008.
Dodatna literatura / Additional Readings: D.L. Baldwin, G.W. Scragg, Algorithms and data structures: the science of computing, Charles River Media, 2004.

Cilji in kompetence:

Spoznati temeljne koncepte analize algoritmov. Spoznati osnovne strategije snovanja algoritmov: deli in vladaj, požrešne algoritme, dinamično programiranje in sestopanje. Spoznati verjetnostne algoritme in osnove hevrističnih algoritmov.

Objectives and competences:

Know fundamental concepts from algorithm analysis.
Know basic algorithm design techniques: divide and conquer, greedy algorithms, dynamic programming, backtracking. Know randomized algorithms and the principles of heuristics.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Razumevanje principov analize algoritmov.
- Razumeti pomen strategij snovanja algoritmov.
- Spoznati različne strategije oziroma pristope pri snovanju algoritmov.
- Razumeti pomen verjetnostnih algoritmov.

Prenesljive/ključne spretnosti in drugi atributi:

- Prenos znanja metod snovanja in analize algoritmov na sorodna oziroma povezana področja (računalništvo,

Intended learning outcomes:

Knowledge and Understanding:

- To understand principals of algorithm analysis.
- To understand the meaning of algorithm design.
- To know a variety of algorithm design techniques.
- To recognize the meaning of randomized algorithms.

Transferable/Key Skills and other attributes:

- Knowledge transfer of methods of algorithm analysis and design into other

diskretna matematika, biologija, ekonomija...)		fields (discrete mathematics, computer science, biology, economics, ...)	
Metode poučevanja in učenja:		Learning and teaching methods:	
• Predavanja • Računalniške vaje • Seminarske vaje		• Lectures • Computer exercises • Seminary exercises	
Načini ocenjevanja:		Assessment:	
	Delež (v %)/ Weight (in %)		
<u>kolokvij</u>	40 %	<u>midterm exam</u>	
<u>sprotne naloge</u>	20 %	<u>coursework</u>	
<u>pisni izpit</u>	40 %	<u>written exam</u>	
Reference nosilca / Lecturer's references:			
1. KORŽE, Danilo, VESEL, Aleksander. Variety of mutual-visibility problems in hypercubes. <i>Applied mathematics and computation</i>. 15 April 2025, vol. 491, [article no.] 129218, 10 str. 2. VESEL, Aleksander. Binary coding of resonance graphs of catacondensed polyhexes. <i>Match : communications in mathematical and in computer chemistry</i>. 2023, vol. 90, no. 2, str. 429-452. 3. KORŽE, Danilo, VESEL, Aleksander. General Position Sets in Two Families of Cartesian Product Graphs. <i>Mediterranean journal of mathematics</i>. 2023, vol. 20, [article no.] 203, 12 str. 4. DENG, Fei, SHAO, Zehui, VESEL, Aleksander. On the packing coloring of base-3 Sierpiński graphs and H-graphs. <i>Aequationes mathematicae</i>. 2021, vol. 95, iss. 2, str. 329-341. 5. VESEL, Aleksander. Efficient proper embedding of a daisy cube. <i>Ars mathematica contemporanea</i>. [Tiskana izd.]. 2021, vol. 21, no. 2, str. 271-282.			