



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	/	3. ali/or 4.	6. ali /or 8.
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
30	15		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.

J.H. Jeffrey, Algorithms and data structures : design, correctness, analysis, AddisonWesley 1997.

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:

- Razumeti pomen ter uporabo 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:

- To understand the meaning and application of 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

Learning and teaching methods:

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

		Delež (v %) / Weight (in %)	Assessment:
Načini ocenjevanja:			
<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. Opravljene 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:

<p>A. Vesel, Linear recognition and embedding of Fibonacci cubes. <i>Algorithmica</i>, 2015, vol. 71, no. 4, str. 1021-1034.</p> <p>Z. Shao, A. Vesel, Modeling the packing coloring problem of graphs. <i>Applied mathematical modelling</i>, 2015, vol. 39, issue 13, str. 3588-3595.</p> <p>A. Vesel, Fast computation of Clar formula for benzenoid graphs without nice coronenes. <i>MATCH Communications in Mathematical and in Computer Chemistry</i>, 2014, vol. 71, no. 3, str. 717-740.</p> <p>A. Vesel, Fibonacci dimension of the resonance graphs of catacondensed benzenoid graphs. <i>Discrete appl. math.</i>, 2013, vol. 161, issue 13-14, str. 2158-2168</p> <p>Z. Shao, A. Vesel, A note on the chromatic number of the square of the Cartesian product of two cycles. <i>Discrete math.</i>, 2013, vol. 313, iss. 9, str. 999-1001.</p>
