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 Izbirni / Elective

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			30		30	3

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:

Prerequisits:

Jih ni.	There are none.

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.

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.

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

Cilji in kompetence:

Objectives and competences:

• Spoznati osnove algoritmičnega reševanja problemov. • Spoznati temeljne koncepte podatkovnih struktur in njihovo uporabo. • Spoznati osnovne strategije snovanja algoritmov.	• Know basic concepts from algorithmic problem solving. • Know fundamental concepts of data structures and theri applications. • Know basic algorithm design techniques.

Predvideni študijski rezultati:

Intended learning outcomes:

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.	Knowledge and understanding: • To understand the meaning and application of 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:　**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:

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