



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Algoritmi in podatkovne strukture
<b>Course title:</b>	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			30		30	3

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,

Algoritmčno 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:

- 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

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

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

<ul style="list-style-type: none"> <li>Lectures</li> <li>Computer and theoretical exercises</li> </ul>
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**Načini ocenjevanja:**

Delež (v %) /  
Weight (in %)

**Assessment:**

<p><u>Sprotno preverjanje:</u></p> <p>Domače naloge</p> <p><u>Izpit:</u></p> <p>Pisni izpit – problemi</p> <p>Pisni izpit – teorija</p> <p>Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.</p> <p>Opravljene sprotne obveznosti so pogoj za pristop k pisnemu izpitu – problemi.</p> <p>Opravljen pisni izpit – problemi je pogoj za pristop k pisnemu izpitu – teorija.</p>	<p>20%</p> <p>40%</p> <p>40%</p>	<p><u>Mid-term testing:</u></p> <p>Homework</p> <p><u>Exams:</u></p> <p>Written exam – problems</p> <p>Written exam – theory</p> <p>Each of the mentioned assessments must be assessed with a passing grade.</p> <p>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.</p>
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**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.