## UČNI NAČRT PREDMETA / COURSE SYLLABUS

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| **Predmet:** | Algoritmi in podatkovne strukture |
| **Course title:** | Algorithms and data structures |

| Študijski program in stopnja<br>Study programme and level | Študijska smer<br>Study field | Letnik<br>Academic year | Semester<br>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<br>Lectures | Seminar<br>Seminar | Sem. vaje<br>Tutorial | Lab. vaje<br>Laboratory work | Teren. vaje<br>Field work | Samost. delo<br>Individ. work | ECTS |
|---|---|---|---|---|---|---|
| 45 | | | 45 | | 120 | 7 |

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

| **Jeziki /**<br>**Languages:** | **Predavanja /**<br>**Lectures:** | Slovenski/Slovenian |
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| | **Vaje / Tutorial:** | Slovenski/Slovenian |

| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | **Prerequisits:** |
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| Jih ni. | There are none. |

| **Vsebina:** | **Content (Syllabus outline):** |
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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:

- 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:

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

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| • Razumeti pomen strategij snovanja algoritmov. | | analysis.<br>• 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:**

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| • Predavanja<br>• Računalniške in teoretične vaje | • Lectures<br>• Computer and theoretical exercises |

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