Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

| UČNI NAČRT PREDMETA / COURSE SYLLABUS | |
|---|---|
| **Predmet:** | **Podatkovne strukture** |
| **Course title:** | Data Structures |

| Študijski program in stopnja<br>Study programme and level | Študijska smer<br>Study field | Letnik<br>Academic year | Semester<br>Semester |
|---|---|---|---|
| Matematika, 1. stopnja | | **2.** | **3.** |
| Mathematics, 1st cycle | | **2.** | **3.** |

**Vrsta predmeta / Course type** Obvezni / Compulsory

**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** | | | **30** | | **135** | **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.

**Prerequisits:**

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.

**Vsebina:**

Analiza algoritma: časovna in prostorska zahtevnost.
Osnovne podatkovne strukture: sklad, vrsta in povezani seznam. Predstavitve in uporaba.
Drevesa: dvojiško drevo, predstavitev in pregled. Kopica in vrsta s prednostjo.
Iskalna drevesa: dvojiška iskalna drevesa, AVL drevesa, rdeče črna drevesa, B drevesa.

**Content (Syllabus outline):**

Algorithm analysis: time and space complexity.
Elementary data structures: stack, queue and linked list. Implementations and applications.
Trees: binary tree, implementation and traversal. Heap and priority queue.

Search trees: binary search tree, AVL tree, red-black tree, B tree.

| | |
|---|---|
| Graf: predstavitve in pregled grafa.<br><br>Tabele simbolov: primeri, zgoščene tabele. | Graph: graph representations and traversal.<br><br>Dictionaries: examples, hash tables. |

**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:** | **Objectives and competences:** |
|---|---|
| Cilj in kompetence tega predmeta so, da študentje spoznajo temeljne koncepte podatkovnih struktur, osnove teorije zahtevnosti algoritmov in značilne podatkovne strukture: osnovne (sklad, vrsta, povezani seznam,..) ter zahtevnejše (drevesa, kopice, iskalna drevesa, imenike). | The objectives and competences of this course are for students to know fundamental concepts of data structures, basic concepts of algorithms analysis as well asa variety of data structures: elementary (stack, queue, linked list, ...) and advanced (trees, heaps, search trees, dictionarys, ...). |

| **Predvideni študijski rezultati:** | **Intended learning outcomes:** |
|---|---|
| Znanje in razumevanje:<br>• Razumevanje zahtevnejših podatkovnih struktur.<br>• Seznaniti se osnovami analize algoritmov.<br>• Razumeti pomen in uporabo osnovnih in zahtevnejših podatkovnih struktur.<br>• Prepoznati vpliv izbire podatkovne strukture na zahtevnost algoritma pri različnih praktičnih aplikacijah.<br><br>Prenesljive/ključne spretnosti in drugi atributi:<br>• Prenos znanja uporabe podatkovnih struktur na sorodna oziroma povezana področja (računalništvo, diskretna matematika, biologija, ekonomija...) | Knowledge and Understanding:<br>• Be able to understand more demanding data structures.<br>• To know the principles of algorithm analysis.<br>• To understand the meaning and application of elementary and advanced data stuctures.<br>• To recognize the influence of data structure to algorithm complexity in practical applications.<br><br>Transferable/Key Skills and other attributes:<br>• Knowledge transfer of data structures theory and applications into other fields (discrete mathematics, computer science, biology, economics, …) |

| **Metode poučevanja in učenja:** | **Learning and teaching methods:** |
|---|---|
| • Predavanja<br>• Računalniške vaje | • Lectures<br>• Computer exercises |

**Načini ocenjevanja:** **Assessment:**

| | Delež (v %)/ Weight (in %) | |
|---|---|---|
| kolokvij | 40 % | midterm exam |
| sprotne naloge | 20 % | coursework |
| pisni izpit | 40 % | written exam |

**Reference nosilca / Lecturer's references:**


1. KORŽE, Danilo, VESEL, Aleksander. Variety of mutual-visibility problems in hypercubes. *Applied mathematics and computation*. 15 April 2025, vol. 491, [article no.] 129218, 10 str.
2. VESEL, Aleksander. Binary coding of resonance graphs of catacondensed polyhexes. *Match : communications in mathematical and in computer chemistry*. 2023, vol. 90, no. 2, str. 429-452.
3. KORŽE, Danilo, VESEL, Aleksander. General Position Sets in Two Families of Cartesian Product Graphs. *Mediterranean journal of mathematics*. 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. *Aequationes mathematicae*. 2021, vol. 95, iss. 2, str. 329-341.
5. VESEL, Aleksander. Efficient proper embedding of a daisy cube. *Ars mathematica contemporanea*. [Tiskana izd.]. 2021, vol. 21, no. 2, str. 271-282