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|---|--|----------------------|-----------------------------------|------------|
| Study program   | Level of studies   |                      | First cycle                       |            |
|   | Study program name   |                      | Physics and Informatics Education |            |
| Course name   | ALGORITHMS   |                      |                                   |            |
| Course ID   | Semester   | Course status        | ECTS credits                      | L+E        |
| <b>CS237</b>  | <b>III</b>   | <b>MANDATORY</b>     | <b>7</b>                          | <b>3+4</b> |
| Lecturer  |  |                      |                                   |            |
| Aims and intended learning outcomes   | <p>This course introduces some basic data structures (arrays, linked lists, stacks, queues, trees and heaps) and algorithms (various sorting algorithms, and algorithms for operations on binary search trees and heaps).</p> <p>Upon successful completion of this course, student should be able to:</p> <ul style="list-style-type: none"> <li>- analyze some of the basic algorithms and evaluate their time and space complexity</li> <li>- define basic static and dynamic data structures and relevant standard algorithms for them: stack, queue, dynamic linked lists, trees, heap, priority queue, hash tables, sorting algorithms,</li> <li>- demonstrate advantages and disadvantages of specific algorithms and data structures,</li> <li>- select basic data structures and algorithms for autonomous realization of simple programs or program parts</li> </ul> |                      |                                   |            |
| Course content  |  |                      |                                   |            |
| <ul style="list-style-type: none"> <li>- Introduction to Algorithms, Algorithm analysis, Complexity of an algorithm. Asymptotic notations;</li> <li>- Design of algorithms (divide and conquer strategy)</li> <li>- The concept of data structure. Types of data structures. Linear and branched data structures.</li> <li>- Linear data structures. Arrays and Linked List. Stacks and Queues. Implementation. Singly Linked and Doubly-linked lists; Static and Dynamic Implementation;</li> <li>- Branched data structures. Trees. Binary Search Trees. Static and Dynamic Implementation; Application of trees;</li> <li>- Heaps. Heap sort.</li> <li>- Hash tables and hashing;</li> <li>- Classical sequential sorting algorithms (bubble sort, selection sort, insertion sort, shell sort, quick sort, radix sort, external sort)</li> <li>- Searching algorithms (sequential search, binary search, binary tree search, external search, interpolation search, Fibonacci search)</li> </ul> |  |                      |                                   |            |
| Student workload (hours)  |  | Grading              |                                   |            |
| Lectures and Exercises  | 105  | Assessment method    | Points                            |            |
| Exam preparation  | 70   | Midterm exams        | 30                                |            |
|   |  | Project and homework | 20                                |            |
| Total   | 175  | Final exam           | 50                                |            |
|   |  | Total                | 100                               |            |
| Literature  |  |                      |                                   |            |
| <p>[1] Lecture notes</p> <p>[2] T. H. Cormen, C. E. Leiserson, R. L. Rivest &amp; C. Stein, Introduction to Algorithms, MIT Press, 2009.</p> <p>[3] Robert Sedgewick and Kevin Wayne, Algorithms, 4th Edition, Addison Wesley Publishing, 2011.</p> <p>[4] A. Drozdek, Data Structures and Algorithms in C++, Course Technology; 3 edition , 2004</p> <p>[5] M. Živanović, Algoritmi, Matematički fakultet, Beograd, 2000.</p> <p>[6] Milo Tomašević, Algoritmi i strukture podataka, Akademska misao, Beograd, 2008.</p> <p>[7] V. Aho, J. E. Hopcroft, J. D. Ullman: Data Structures and Algorithms, Addison-Wesley, 1983.</p> <p>[8] D. E. Knuth, The Art of Computer Programming, Volume 1: Fundamental Algorithms, Addison-Wesley, 1968</p>  |  |                      |                                   |            |
| Remarks   |  |                      |                                   |            |
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