Tárgytematika / Course Description

Theory of Algorithms

GKNM_MSTA002

Tárgyfelelős neve / Teacher's name: Pusztai Pál

Félév / Semester: 2018/19/1

Beszámolási forma / Assesment: Vizsga

Tárgy heti óraszáma / Teaching hours(week): 2/2/0

Tárgy féléves óraszáma / Teaching hours(sem.): 0/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

The aim of the subject is to give an overview of algorithms and their data structures.

TANTÁRGY TARTALMA / DESCRIPTION

1-2. Efficiency of algorithms. Asymptotic notation. Sorting methods: insertion sort, merge sort, quicksort, heapsort. Sorting in linear time: counting sort, radix sort, bucket sort. Priority queues with heaps. Medians and order statistics. Selection in expected linear time.

3-4. Dynamic sets. Stacks and queues with arrays. Linked lists. Implementing pointers and objects with arrays. Representing rooted trees. Hash tables: direct-address tables, hash functions, open addressing.

5-7. Binary search trees. Searching and querying minimum, maximum, successor, predecessor. Insertion and deletion. Red-black trees: properties, rotations, insertion. Interval trees. B-trees and its basic operations.

8-10. Dynamic programming. Matrix-chain multiplication. Longest common subsequence. Greedy algorithms. An activity-selection problem. Huffman codes. Approximation algorithms. The set-covering problem.

11-12. String matching. A naive string-matching algorithm. The Rabin-Karp algorithm. String matching with finite automata. The Knuth-Morris-Pratt algorithm.

13-14. The Rivest-Shamir-Adleman (RSA) public-key cryptosystem and its mathematical background: greatest common divisor, modular arithmetic, solving modular linear equations, powers of an element.

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD

Writing exam: test (5 scores) and practical tasks (15 scores). Rating: 0-9:1, 10-12:2, 13-15:3, 16-18:4, 19-20:5.

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

Cormen, T. H. - Leiserson, C. E. - Rivest, R. L. - Stein, C.: *Introduction to Algorithms,* MIT Press, 2009.