Tárgytematika / Course Description

Theory of Algorithms

GKNM_MSTA002

Tárgyfelelős neve / Teacher's name: Pusztai Pál
Félév / Semester: 2020/21/1
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 goal of the course is to give an overview of algorithms. The necessary data structure and the efficiency of the algorithms will be described and analysed too.

TANTÁRGY TARTALMA / DESCRIPTION

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.

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.

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.

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

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

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.