Syllabus for Data Structures and algorithms (Tentative)

This is a first level course for the students of Msc Big Data Analytics. It has no prerequisites.

Credits: 4

Instructor: Dhyanagamyananda

Session: August 2022 – Jan 2023

Basics of computation

1. Data representation
   integers, floating point, ascii, b/w image, color image, video
2. Programming concepts

   constants, variables, assignment, arithmetic expressions, logical expressions, condtional statements, iteration, procedures, libraries,
3. Growth of functions
   asymptotic analysic, Big Oh, small Oh, Big Omega, small Omega notation

Data Structures

4. Data Structures
   Array, List, Stack, Queue, Graphs, Trees
5. Big Data Structures

   Inverted Files – B-Trees, Tries, Patricia Trees

Algorithmic Methods

6. Divide and Conquer
   Finding MinMax, n-bit multiplication, Matrix Multiplication (3 methods)
7. Iterative Sorting algorithms
   Selection, Bubble, Insertion, Counting
8. Recursive Sorting Algorithm
   Quick, Merge, Polyphase Merge
9. Searching
   Sequential, Binary, Hash, Binary Search,
10. Greedy Algorithms

    Single Source Shortest Path, Minimum Spanning Tree,
11. Graph Algorithms

    Definition of Graph, Graph Traversals- Binary: in/post/pre order, Depth First, and Breadth First searching,
12. Mathematical Algorithms:,
    Euclid algorithm for gcd computation, Random number generation: Linear and additive congruential Method, Horner’s method for polynomial computation, Gaussian Elimination
13. Dynamic programming
    Matric Chain Multiplication, ASSP-Bellman-ford, Johnson, Floyd-Warshal

14. String Matching
    Knuth-Morris-Pratt, and Robin-Karp Algorithms