

# Syllabus for Data Structures and Algorithms (DSA)

## Algorithm

Data Structure def, classification, ADT  
Algorithm representation and complexity  
Pointers, strings, arrays (1-D and n-D)  
Elapsed time  
malloc, realloc, calloc

## Stacks

Stacks (Lab 1)  
Pre-, in-, post-fix conversions  
Evaluations of expressions

## Lists and Queues

Linked lists (Lab 2)  
Queues (Lab 3)  
Circular queues

## Recursion

Simple recursion  
Fibonacci numbers  
Backtracking: 8-queen problem

## Searching and Sorting

Binary search (Lab 4)  
Selection sort  
Insertion sort  
Mergesort  
Quicksort (Lab 5)  
Quickselect

## Graph Theory

Graphs  
Simple trees  
Heaps, heapsort (Lab 6)  
Priority queues  
Binary trees,  $n$ -ary trees  
Binary search trees (Lab 7)  
Traversals  
Trie tree (Lab 8)  
Kruskal's MST using disjoint sets  
Dijkstra's Algorithm  
Disjoint sets (Lab 9)  
Floyd-Warshall's algorithm (Lab 10)  
BFS and DFS searches (Lab 11)  
AVL trees, B-trees  
Threaded trees

## Hashing

Hashing by chaining (Lab 12)  
Perfect hashing function

## String algorithms

Simple string manipulations  
Pattern search with Rabin-Karp approach

## Tools

**Operating system:** GNU/Linux  
**Langauges:** ANSI C (C89)  
**Graph visualization tool:** graphviz  
**Data and function plotter:** gnuplot

## Books

1. **Introduction to Algorithms** by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein (2Ed) (Text)
2. **Data Structures Using C and C++** by Yedidyah Langsam, Moshe J. Augenstein and Aaron M. Tenenbaum (Text)
3. **The C Programming Language** (2nd Edition) by Brian W. Kernighan and Dennis Ritchie (Ref)
4. **Expert C Programming** by Peter van der Linden (Ref)
5. **C Traps and Pitfalls** by Andrew Koenig (Ref)