CSCI 2100C
Data Structures

2nd Term, 2021/2022

http://course.cse.cuhk.edu.hk/~csci2100c/

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Assessment Scheme:

Assignments: 25% (6.25% each)
Quizzes: 25% (12.5% each)
Examination: 50%

- Each assignment includes written and programming parts.
- There is no mid-term examination.
- There will be two quizzes on 22 February and 22 March (45 min each).
- The final examination lasts for 2 hours.

What Will You Learn in this Course

- Data Structures and Their implementations
- Applications of Data Structures
- Abstract Data Types and Their Implementations in C
- Introduction to Complexity Analysis
- Advanced Programming

Stacks

- Push
- Pop
- Implementation

Queues

- Enqueue
- Dequeue
- Implementation

Symbol Tables

- Enter
- Lookup
- Implementation: Hashing; callback functions

Lists (<u>not</u> *linked list*!)

- ✈ Head
- ✈ Tail
- ✈ Implementation: Cons, Empty Lists
- ✈ Recursive programming

Sorting

- ✈ Selection sort
- ✈ Merge sort
- ✈ Quicksort
- ✈ Recursive programming

Complexity

- ✈ Big-O notation

Trees

- Binary search trees
  - Implementation
  - Node insertion; node deletion
  - Searching
- AVL trees
  - Node insertion: single / double **rotations**
  - Searching

Expression trees

- Evaluation
- Tree traversals: pre-order; in-order; post-order

Tries

- ✈ Cost of a trie; Huffman's algorithm

B-Trees

- ✈ Order of a B-tree
- ✈ Key insertion

Priority Queues

- ✈ Priority-Enqueue
- ✈ Priority-Dequeue
- ✈ Implementation: partially ordered tree, heap

Splay Trees

- ✈ Splaying at a node

Disjoint Sets

- Union: Union-by-height
- Find

Red-black Trees

- Node insertion

Graphs

- Implementation: adjacency matrices; adjacency lists
- Topological sort
- Traversal: Breadth-first, Depth-first
- Shortest paths: Dijkstra's algorithm
- Minimum spanning trees: Kruskal's algorithm
- Minimum spanning trees: Prim's algorithm