ENSF 694
Principles of Software Development II

Summer 2023

Course Information

- **Textbook:**
  - Introduction to Algorithms, T. Cormen, C. Leiserson, R. Rivest, C. Stein (4th Ed.)
- D2L
  - Course Outline
  - Course Contents
- LEC 1 MW 08:30 - 11:15 ENE 241
- LAB 1 MW 12:00 - 13:50 ENE 241

Course Information

- **Instructor**
  - Kashfia Sailunaz (kashfia.sailunaz@ucalgary.ca)
- **Teaching Assistants**
  - Leo Wei (hanzhe.wei@ucalgary.ca)
  - Shirin Yamani (yamani.shirin@ucalgary.ca)

Grading

A+	$T \geq 95.0\%$
A	$90.0\% \leq T < 95.0\%$
A-	$85.0\% \leq T < 90.0\%$
B+	$80.0\% \leq T < 85.0\%$
B	$75.0\% \leq T < 80.0\%$
B-	$70.0\% \leq T < 75.0\%$
C+	$65.0\% \leq T < 70.0\%$
C	$60.0\% \leq T < 65.0\%$
C-	$56.0\% \leq T < 60.0\%$
D+	$53.0\% \leq T < 56.0\%$
D	$50.0\% \leq T < 53.0\%$
F	$T < 50.0\%$

Learning Outcomes

- Design and develop software programs in Java and use different design and development utilities and tools.
- Have a deep understanding of data structures and algorithms.
- Develop problem-solving skills.

Course Contents

- A fundamental study of data structures and algorithms for engineering students.
- Topics include –
  - arrays,
  - lists,
  - stacks,
  - queues,
  - trees,
  - hash tables,
  - graphs,
  - algorithms for searching and sorting,
  - and introduction to algorithm analysis.

Tentative Course Schedule

Weeks	Theory Class		Lab		Others
	Monday	Wednesday	Monday	Wednesday	
Jun 26 - Jun 30	Intro, Algo complexity	Searching	Algo complexity	Searching	
Jul 03 - Jul 07	Canada Day (HOLIDAY)	Sorting	Canada Day (HOLIDAY)	Sorting	**Assignment1 (July 09, Sunday, 11:59 PM)**
Jul 10 - Jul 14	Arrays, Linked Lists	Linked lists	Arrays, Linked Lists	**Quiz 1 (Complexity, Searching, Sorting)**	
Jul 17 - Jul 21	Stack, Queue	Tree, AVL trees	Stack, Queue	Project Discussion	**Assignment2 (July 23, Sunday, 11:59 PM)**
Jul 24 - Jul 28	Heaps, Heapsort	Graph	Tree	Heaps, Heapsort	
Jul 31 - Aug 04	Graph	Hash tables	Graph	**Quiz 2 (Arrays, Linked Lists, Stack, Queue, Tree, Heaps, Heapsort, Graph)**	**Assignment3 (August 06, Sunday, 11:59 PM)**
Aug 07 - Aug 08	AB Heritage Day (HOLIDAY)	No Classes	AB Heritage Day (HOLIDAY)	No Classes	**Project (August 08, Tuesday, 11:59 PM)**

Marks Distribution

Component	Weight	Distribution
Assignments	30%	A1 – 10%, A2 – 10%, A3 – 10%
Quizzes	40%	Q1 – 20%, Q2 – 20%
Project	30%	Individual Project – 30% (Lab + Prj)

Late Submissions

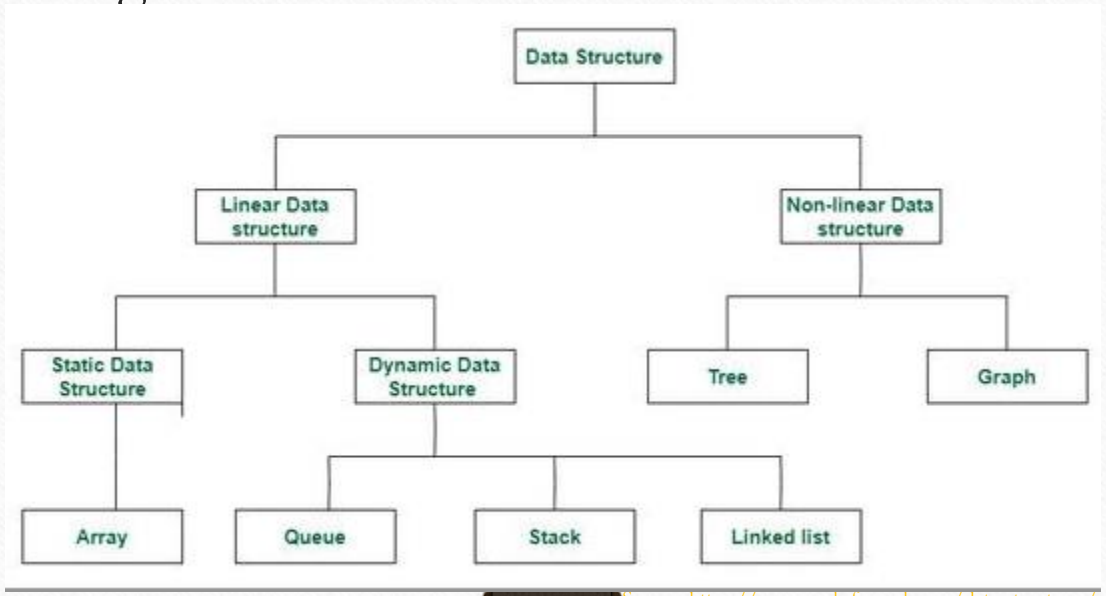
- Assignments/Project – 12.5% penalty for each day after the deadline.

- If a student misses a quiz due to illness or domestic affliction, they must contact the instructor by email as soon as possible, within 24 hours of the scheduled assessment. Depending on the situation, the instructor reserves the right to move the weight to another quiz or the final project.

Introduction to Data Structures & Algorithms

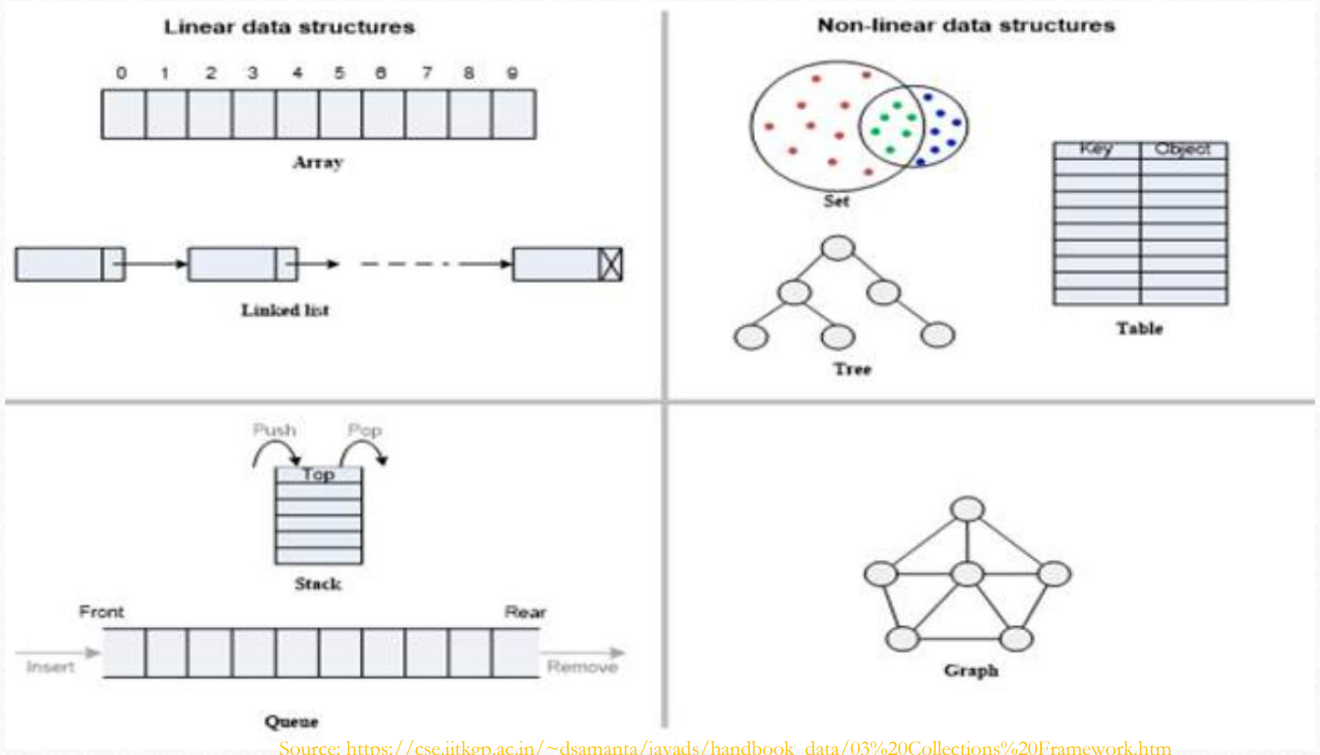
Data Structure

- Data structure is a format for data organization, storage and management to make the data management more efficient.



Source: https://www.geeksforgeeks.org/data-structures/

Data Structure



Source: https://cse.iitkgp.ac.in/~dsamanta/javads/handbook_data/03%20Collections%20Framework.htm

Algorithm

- Informally, an algorithm is any **well-defined computational procedure** that takes some value, or set of values, as **input** and produces some value, or set of values, as **output** in a **finite amount of time**. An algorithm is thus a sequence of computational steps that transform the input into the output.

- Algorithm can also be viewed as **a tool for solving a well-specified computational problem**. The statement of the problem specifies in general terms the desired input/output relationship for problem instances, typically of arbitrarily large size. The algorithm describes a specific computational procedure for achieving that input/output relationship for all problem instances.

Algorithm

- Sorting Problem
- Input: A sequence of n numbers <a1, a2, a3, …. an>
- Output: A permutation/reordering <a'1, a'2, a'3, …. a'n> of the input sequence such that a'1 <= a'2 <= a'3 <= ….. <= a'n
- Algorithm
  - Steps to sort any set of numbers/components

Thank You