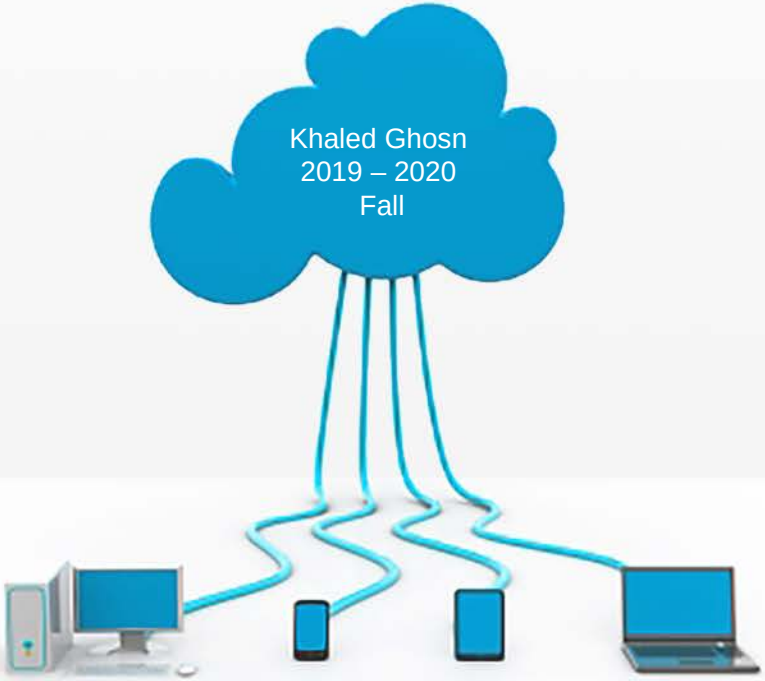
ARTS, SCIENCES & TECHNOLOGY
UNIVERSITY IN LEBANON
AUL

CSC 311

Data Structures

Introduction

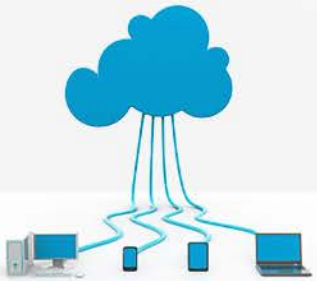


Khaled Ghosn
2019 – 2020
Fall

What's this course about?

An algorithm (program) is a well-defined computational procedure that

- takes some values (data) as "input"
- produces some result as "output"



Programs receive, manipulate, and output data

- Need to organize data according to problem being solved
- Data structures are methods for organizing data

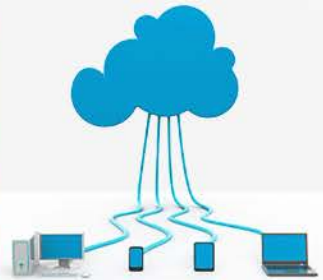
Data Structures (DS)

- **Algorithm:** abstract way to perform computation tasks

- **Data Structure**: Abstract Data Type (ADT)
  - **abstract way to organize data**
  - a "toolkit" of operations for manipulating data

- Data structures are methods for organizing data
  i.e., how data is structured for use by the program

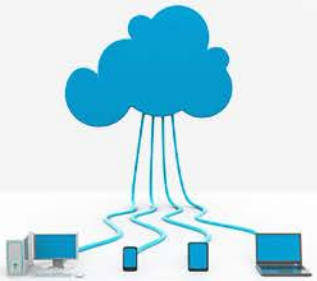
  - Implementation of some operations becomes easier or harder
  - Speed of program may dramatically decrease or increase
  - Memory used may increase or decrease



Data Structures (DS)

Data Structures are used … everywhere:

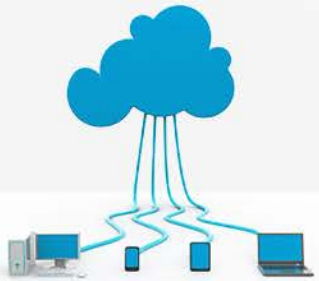
- Systems (Operating Systems, Computer Networks)
- Graphics
- Databases
- Theory
- Artificial Intelligence
- Information Retrieval
- …



Data Structures (DS)

Structures of Data

- Variables (int, boolean, String, …)
- Arrays (one-dimensional array, two-dimensional array, …), Strings
- Classes
- Linked Lists
- Queues
- Stacks
- Trees (Binary Trees, BST, AVL, …)
- Hash Tables
- Graphs
- …
- Smarter data structures can be abstracted



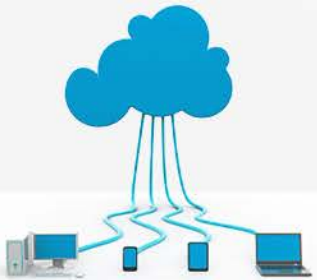
Course Description

In this course, we will look at:

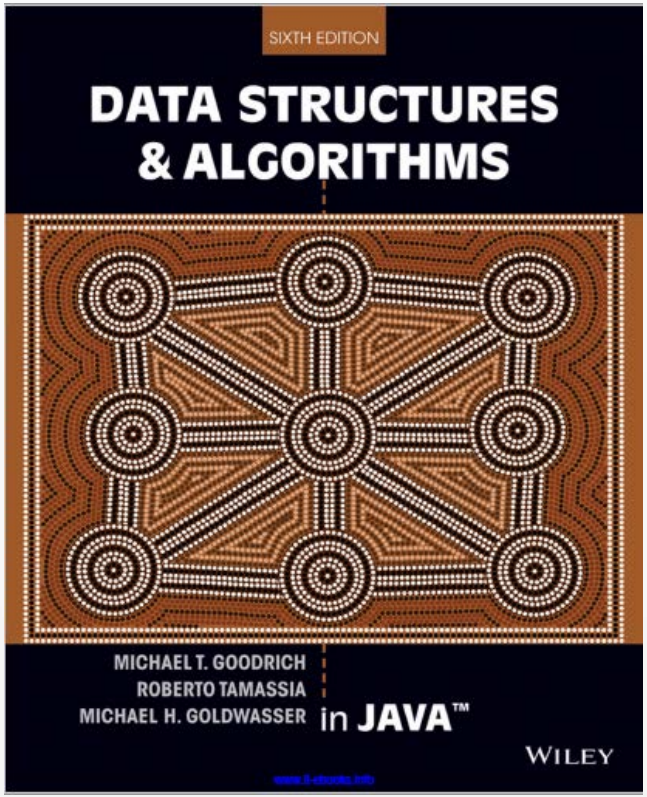
- Algorithms for solving problems efficiently
- Data structures for efficiently storing, accessing, and modifying data

Goals:

- Understand the mathematical fundamentals needed to analyze algorithms
- Learn how to compare the efficiency of different algorithms in terms of running time and memory usage
- Study a number of standard algorithms for data manipulation and learn to use them for solving new problems
- Study different implementation techniques for some fundamental ADTs
- Learn how to choose the "best" one
- Learn how to modify standard ADTs for specific problems, and create new ADTs

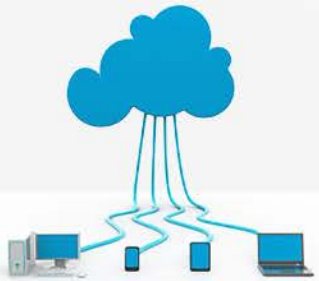


Textbook



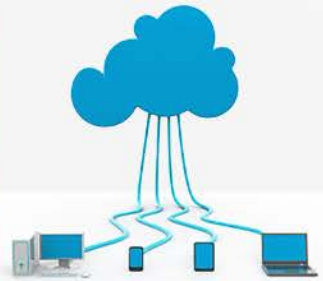
Data Structures and Algorithms in Java

6th Edition
2014
Wiley



Assessment

Attendance	10%
Homework	10%
Quizes	15%
Midterm	25%
Final Exam	40%



Rules

Classroom Etiquette

All laptop computers, cell phones, tablet computers must be closed durin g all classroom hours

- If you wish to use any device, you are welcome to step outside
- Devices distract the most people behind and around the user
- You require a Verification of Illness form to use a device in class
- The classroom is not for watching the next football match - even if your favorite team is playing - but you are welcome to sit outside

FIFA WORLD CUP Brasil

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Rules

Attendance Policy

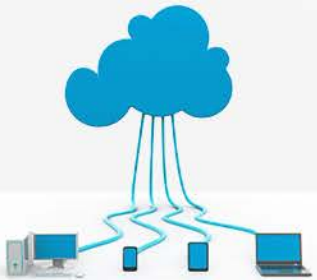
The instructor has the right not to allow in any latecomers

The student is responsible for any work done, and for any announcement made during his absence

If a student is absent for more than 20% of classes, a grade of **AW** is assigned automatically

Attendance will be taken after a maximum of ten minutes from the beginning of class (you have to be in class before the beginning time of class)

Being late for difficult circumstances might be taken into consideration if an email is sent before the coming class



Rules

Java

You will be using the **Java** programming language in this course

This course does not teach Java programming

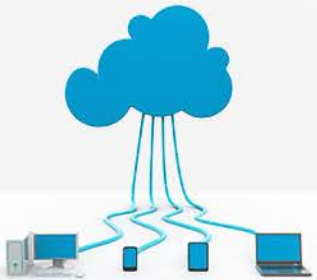
- You will use Java to demonstrate your knowledge in this course

One lecture covers

- Revision about Classes using Java

Commenting code is necessary for engineers:

- Engineers who do not comment code will not encourage employees and contracted programmers to comment their code
- This will lead to significant additional costs



Rules

Improving Your Performance

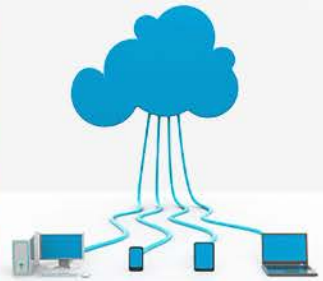
The human brain can retain approximately 5-9 independent items of information in its short-term memory

> George Miller, *The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information*, Psychological Review, Vol.63 pp.81–97, 1956

The introduction of new information causes the brain to discard an item currently in your short-term memory

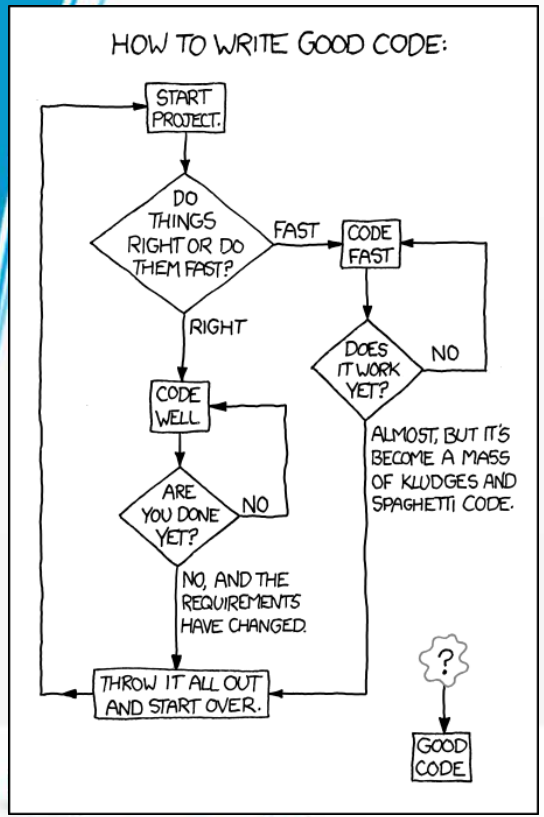
- For example, consider the 12 words which will appear on the next sequence of screens

To transfer information from your short-term memory to your long-term memory, that information must be imposed on your mind at least three times



Rules

Improving Your Performance



You should always try the following:

- Look at the slides before class
- Attend lectures
  - You see the information again with commentary
- Review the lecture during the evening
  - Rewrite and summarize the slides in **your** words

In addition to this, you should:

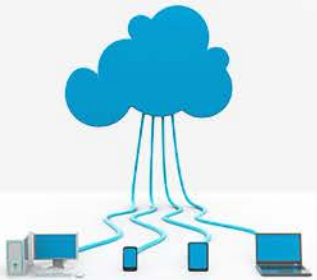
- Get a reasonable nights sleep (apparently this is when information is transferred to your long-term memory), and
- Eat a good breakfast (also apparently good for the memory)

Rules

Plagiarism

All assignments must be done individually:

- You may not copy code directly from any other source
- Plagiarism detection software will be used on all of the assignments
- If you viewed another code (from books or lecture notes), you must include a reference in your assignments
- You may not share code with any other students by transmitting completed functions to your peers
- You may discuss assignments together and help another student debug his or her code; however, you cannot dictate or give the exact solution
- When one student copies from another student, both students are responsible (exceptions are made for outright theft)



Rules

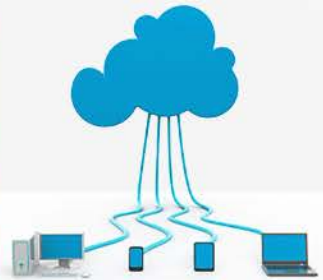
Plagiarism

All assignments must be done individually:

- The penalty for plagiarism on an assignment is a mark of 0
- Regardless if Projects are counted or not
- A student who cheats must receive a grade lower than a student who did not hand in a project

The best way to avoid plagiarism is:

- review the Programming 2 course
- read the assignments as soon as they are available
- start the assignment so that there is sufficient time to contact me if you have difficulty
- do not give your code to anyone



Instructor Contact

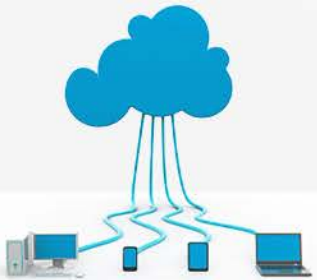
Assignments can be sent by e-mails via **Google Classroom**; otherwise will be ignored!

Facebook is never accepted for sending assignments, otherwise you are welcome to contact for any assistant

Do not hesitate to contact me for any assistance through the e-mail:

KhaledGhosn@Hotmail.com

Put in the e-mail subject: [DS]
example: [DS] homework1
Otherwise, will be ignored!

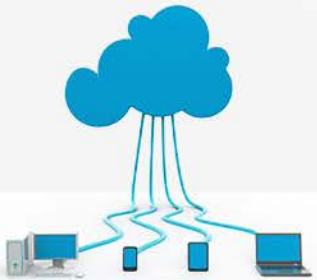


Usage Notes

These slides are made publicly available for anyone to use

If you choose to use them, or a part thereof, I ask only three things:

- that you inform me that you are using the slides,
- that you acknowledge my work, and
- that you alert me of any mistakes which I made or changes which you make, and allow me the option of incorporating such changes (with an acknowledgment) in my set of slides



Sincerely,
Ghosn Khaled
KhaledGhosn@Hotmail.com