IM 1010: Data Structures and Advanced Programming Spring 2021 (109-2)

Instructors: Bing-Yu Chen and Fu-Yin Cherng
Department of Information Management
National Taiwan University

This is an introductory course on data structures concerning the various ways of organizing data so that the data can be accessed and manipulated efficiently by an application. A central concept is that of an abstract data type, which is a collection of data and a set of operations on the data. The course, therefore, focuses on the fundamental concepts, techniques, and tools for the design and implementation of abstract data types, following the teaching of object-oriented design and programming for computer problem-solving. The first few weeks of this semester will be used to introduce object-oriented programming. The other weeks are for data structures. We use the programming language C++ in this course. C++ is just something that facilitates the delivery of the concepts, principles, and ideas.

This is a required course for first-year undergraduate students in the Department of Information Management (IM) at National Taiwan University. We assume students have taken "Programming Design" in the IM department or an introductory programming course at a similar level. All students who have the required background are welcome to enroll in or audit this course. If there are too many students who want to enroll in this course, the instructor will announce the selection process in the first or second lecture. *There will be a small quiz in the first lecture, and the students can assess their level of the prerequisites to determine if they can manage the loading or this course.*

Basic information

Instructor.

- Bing-Yu Chen (陳炳宇): robin(AT)ntu.edu.tw; Room 1112, Management Building 2. https://graphcis.csie.ntu.edu.tw/~robin/
- Fu-Yin Cherng (程芙茵): fycherng(AT)ntu.edu.tw; https://fuyincherng.github.io/

Teaching Assistants.

- 楊令謙: r08725017(AT)ntu.edu.tw.
- 廖方盈: r09725048(AT)ntu.edu.tw.

Lectures. 9:10-12:10 am Tuesday. Room 301, Management Building 2.

Textbook.

- **[CH]** Data Abstraction and Problem Solving with C++: Walls and Mirrors by Carrano and Henry, sixth edition, Pearson, 2012. 台灣代理: 全華圖書, (02) 2262-5666.
- **[DD]** C++ How to Program: Late Objects Version by Deitel and Deitel, seventh edition, Pearson Education. 台灣代理: 歐亞圖書, (02) 8912-1188.

Reference.

- **[CLRS]** Introduction to Algorithms by Cormen, Leiserson, Rivest and Stein, third edition, MIT Press, 2009.

Online Resources.

- The course website: NTU COOL, https://cool.ntu.edu.tw/courses/4433/.
- To submit programming assignments: PDOGS, https://pdogs.ntu.im.

Grading

Breakdown.

- Quiz: 5%.
- Homework: 30% (the lowest one will be dropped).
- Midterm and Final exams: 35% (the higher one counts for 20%).
- Final project: 30%
- (Bonus) class participation: 5%

Conversion rule. The final letter grades will be given according to the following conversion rule:

Letter	Range	Letter	Range	Letter	Range	Letter	Range	Letter	Range
F B	[0, 60) [73, 77)	C- B+	[60, 63) [77, 80)	C A-	[63, 67) [80, 85)	C+ A	[67, 70) [85, 90)	B- A+	[70, 73) [90, 100]

Regrading. The TAs will grade everything and regrade them upon request. If you have a regrading request, please contact the TAs directly.

Tentative schedule

Week	Date	Lecture	Textbook	Instructor
1	2/23	Course Overview (including review of C++) and *quiz*	DD 1-11, 18, 19, 22	Robin / Fu-Yin

2	3/2	Inheritance and Polymorphism / Template and Exception handling	DD12, 13 DD14, 16 (CH 1)	Fu-Yin
3	3/9	Array- and Link-based bags	CH 3, 4	Fu-Yin
4	3/16	Recursion and Algorithm efficiency	CH 2, 5, 10	Fu-Yin
5	3/23	Stacks	CH 6, 7	Robin
6	3/30	Lists	CH 8, 9, 12	Robin
☐	4/6	Spring break (No class)	N/A	
7	4/13	Sorting	CH 11	Fu-Yin
8	4/20	*Midterm exam* (until Sorting on 4/13)	N/A	
9	4/27	Queues	CH 13, 14	Robin
10	5/4	Trees	CH 15, 16	Robin
11	5/11	Heaps	CH 17	Robin
12	5/18	Dictionaries (Hashing)	CH 18	Robin
13	5/25	Balanced Search Trees	CH 19	Fu-Yin
14	6/1			
15	6/8	Graphs	CH 20	Fu-Yin
16	6/15	*Final exam*	N/A	
17	6/22	*Final project first due*	N/A	
18	6/29	*Final project final due*	N/A	