

# IM 1010: Data Structures and Advanced Programming Spring 2019 (107-2)

Instructor: Ling-Chieh Kung and Chuang-Wen You  
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 in National Taiwan University. We assume students have taken “Programming Design” in the IM department or an introductory programming course at the similar level. All students who has 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 lecture.

## Basic information

### Instructor.

- Ling-Chieh Kung (孔令傑): lckung(AT)ntu.edu.tw; Room 413, Management Building 2.  
<http://www.im.ntu.edu.tw/~lckung/>.
- Chuang-Wen You (游創文): cwyou@ntu.edu.tw.  
<https://sites.google.com/site/cwyou2004/>.

**Teaching Assistants.** TBD.

**Lectures.** 2:20-5:20 pm, Monday. Room 202, Management Building 2.

### Textbook.

- [CH] *Data Abstraction and Problem Solving with C++: Walls and Mirrors* by Carrano and Henry, sixth edition, Pearson, 2013. 臺灣代理: 歐亞圖書, (02) 8912-1188.
- [DD] *C++ How to Program: Late Objects Version* by Deitel and Deitel, seventh edition, Pearson Education. 臺灣代理: 歐亞圖書, (02) 8912-1188.

### On-line Resources.

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

# Grading

## Breakdown.

- A quiz and its make-up homework: 5%.
- Homework: 45%.
- Two exams: 50% (the higher one counts for 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	[0, 60)	C-	[60, 63)	C	[63, 67)	C+	[67, 70)	B-	[70, 73)
B	[73, 77)	B+	[77, 80)	A-	[80, 85)	A	[85, 90)	A+	[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	Note
1	2/25	Review of C++ and <i>quiz</i>	DD 1-7, 9-11, 19, & 22	Kung
2	3/4	File I/O, C++ strings, and header files	DD 8 & 18	Kung
3	3/11	Inheritance and polymorphism	DD 12 & 13	Kung
4	3/18	Template and exception handling	DD 14 & 16	Kung
5	3/25	Array- and link-based bags	CH 3 & 4	Kung
6	4/1	(No class: spring recess)	N/A	Kung
7	4/8	Recursion and algorithm efficiency	CH 2, 5 & 10	Kung
8	4/15	Stacks	CH 6 & 7	Kung
9	4/22	<i>Midterm exam</i>	N/A	Kung
10	4/29	Lists	CH 8 & 9	You
11	5/6	Sorted lists, queues, and priority queues	CH 12 & 13	You
12	5/13	Queues, priority queues, and trees	CH 14 & 15	You
13	5/20	Trees	CH 16	You
14	5/27	Heaps and dictionaries	CH 17 & 18	You
15	6/3	Graphs	CH 20	You
16	6/10	Advanced topics	N/A	You
17	6/17	<i>Final exam</i>	N/A	You
18	6/24	(No class)	N/A	You

## Policies

**“Flipped classroom”.** For some lectures, the instructor will do “lectures in videos, discussions in classes.” Before those lectures, the instructor will upload videos containing some materials to be discussed on that day. The total length of those videos for one lecture will be shorter than 150 minutes. Students must find their own time to watch the videos before the lecture. During lectures, we answer students’ questions regarding materials in the videos, provide exercise problems for students to do on-site exercises, and talk about some supplemental materials. Lecture problems do not count for grades; they are for the learning purpose only.

**Homework.** There will be several homework assignments. Please upload your C++ source codes (and other files, if required) to the online grading system PDOGS by the due time. No submission in class or in lab. No hard copy. No late submission. For those problems that do not require programming, please put your answers in a PDF file and upload the file. While discussions are highly encouraged, each student must turn in her/his own homework. Cheating will result in severe penalty for everyone involved. The lowest one homework grade will be dropped (i.e., you may skip one homework if you want).

**PDOGS.** For programming assignments, we rely heavily on the Programming Design Online Grading System (PDOGS, or P-Dogs). After a student uploads her/his C++ source file, the system will automatically compile and run the program with respect to some testing data, calculate grades, and display the grades to the student. One may repeatedly modify his program and upload again and again until she/he is satisfied. Only the last grades before the due time will be recorded.

**Office hour.** You are welcome to the instructors’ office hour to ask them any question. You may ask them to clarify some concepts, give hints for homework problems, or discuss the final project. In fact, discussions not related to course materials are also welcome. However, because one must have enough painful experiences in debugging and revising programs, the instructors (and TAs) may (and should) refuse to debug for any student. If you want to schedule a meeting, please feel free to send the instructor an e-mail at any time.

**Attendance and class participation.** We do not count attendance. If you have something more important to do, please feel free to drop a lecture or a lab. Nevertheless, we encourage class participation and include it in evaluating each student. During lecture time or office hour, you are more than welcome to ask or answer questions and provide comments. You are also encouraged to use Piazza for after-class discussions.

**Exams.** For two Mondays we will have exams during the lecture time. Both exams are closed-book. No electronic device is allowed. Cheating will result in a severe penalty for everyone involved.