Shanghai New York University
Engineering and Computer Science Department

Course Outline
Data Structures, CSCI-SHU 210, 4 Credits, In person
Spring 2022
Prof. Wilson Tam

Lecture for Sec 1 Tuesday 3:15 pm – 5:05 pm; Room No. Pudong_203
Lecture for Sec 2 Monday 11:15 am – 1:05 pm; Room No. Pudong_204
Recitation for Sec 3 Thursday 3:15 pm – 5:05 pm; Room No. Pudong_203
Recitation for Sec 4 Friday 9:00 am – 10:50 am; Zoom only
Recitation for Sec 5 Wednesday 11:15 am - 1:05 pm; Room No. Pudong_604

Subject to Change Statement:
The syllabus and course schedule may be subject to change. Changes will be communicated via email and in NYU Brightspace site. It is your responsibility to check email messages and course announcements to stay current in the course.

To Contact Professor:
Email: yt2267@nyu.edu
Room No. 1162-5, 11th FL, NYU Shanghai Pudong Campus
Phone: +86 02120595071
Zoom Link: https://nyu.zoom.us/j/6743549294 (only for office hour usage)
Office Hours:

- Monday 2 PM to 4 PM
- Thursday 1:30 PM to 3:30 PM
- Open Door Policy (if you see me in my office and I'm available, you can talk/discuss with me)
- Other times by appointment. To make an appointment, please send an email mentioning CSCI-SHU 210 and your section # in subject line. Don't forget to include your name and NYU ID in the body of the email.

More Contacts:
Yisong (Brian) Wang (Recitation Instructor)

- Room No. 1162 and Email: yw6412@nyu.edu
- Office hours: Wednesday 3 PM to 5 PM, Friday 11 am to 1 PM

Sihang Xu (Grader)

- Email: sx2208@nyu.edu

Alexander Guanwan (LA)

- Email: ag7770@nyu.edu
- Office hours: Tuesday 1 PM to 3 PM

Yifei (Jack) Zhang (LA)

- Email: yz7166@nyu.edu
- Office hours: Wednesday 9am-11am, Friday 1:30pm-2:30pm

Margaret Mao (LA)

- Email: wm2178@nyu.edu
- Office hours: Thursday 12pm-2pm

Course Prerequisites:

ICS, OR A in ICP, OR A- in ICP and enrolled in ICS concurrent to Data Structures.

Course Description:

Data structures are fundamental programming constructs which organize information in computer memory to solve challenging real-world problems. Data structures such as stacks, queues, linked lists, and binary trees, therefore constitute building blocks that can be reused, extended, and combined in order to make powerful programs. This course teaches how to implement them in a high-level language, how to analyze their effect on algorithm efficiency, and how to modify them to write computer programs that solve complex problems in a most efficient way.

Course Objectives:

1. Master on object-oriented programming skills.
2. Gain knowledge on algorithms analysis, time complexity and space complexity.
3. Use recursion to solve programming problems.
4. Hands on experiences on implementing standard data structures building blocks such as stacks, queues, linked lists, trees, search trees, trie, hash tables, maps, sets, priority queues, graphs representation and use these building blocks to solve real world problems and understand their runtime complexities and space complexities.
6. Improve problem solving skills and solve programming problems more efficiently in terms of time and space complexity.
7. Learn how to create custom data structures like trie, LRU Cache to solve real world problems.
8. Hands on experiences on different sorting algorithms (simple sorting, merge sort, quick sort, radix sort, searching algorithms (linear search, binary search), graph explorations (DFS, BFS), shortest path algorithms, minimum spanning trees, selection algorithms, priority queues and apply these concepts to solve problems.

Course Structure:

Most of the material will be presented in lectures. Reading assignments from the textbook, programming and other exercises in the Recitation class, and weekly homework/Programming assignments will reinforce this material. You should expect to spend a substantial time outside

the class working on the homework/programming assignments.

Online quizzes, Homework Assignments, Recitations, Lectures, Solutions and other important announcements will be posted on NYU Brightspace. You should check the course page every day and sign up for e-mail notification of announcements.

Lectures: Lecture slides will be uploaded in NYU Brightspace. Lectures will be held mixed-mode ~~in-person~~, with possible accommodation to students who cannot come back to campus on time due to Covid-19 situation by providing temporarily Zoom meeting ~~or lecture video upload, whichever is most suitable~~. Students who are in Shanghai should attend the lectures in person and should not attend the Zoom meeting.

Recitations: Recitation worksheets/materials will be uploaded in NYU Brightspace. Recitations will be held mixed-mode ~~in-person,~~ with possible accommodation to students who cannot come back to campus on time due to Covid-19 situation by providing ~~temporarily~~ Zoom meeting. Students who are in Shanghai should attend the recitations in person and should not attend the Zoom meeting. Please make sure you have checked the slides, worksheets before starting the recitations tasks. You will have about 24 hours to complete the recitation tasks. You have to submit your work using NYU Brightspace Assignment Section. **Completion of Recitation Sessions' tasks will be graded.** It's okay if you don't find the right solution for the tasks assigned for the Recitation session. We'll see whether you have tried to complete all the tasks mentioned in the Recitation session's worksheets. **Marks will be deducted for questions with blank answers/codes.**

Readings:

The **textbook** for the course is:
Data Structures and Algorithms in Python, 1st Edition.
Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser.
ISBN-13: 978-1118290279. ISBN-10: 1118290275.
There is also an electronic version of the textbook, which is less expensive. Several copies are on reserve in the Library.

Required Hardware and Software: Laptops and Python 3.1 or later version. Students will be asked to turn off their Laptop's WiFi connection during the class. No connected electronic devices will be allowed except for note taking and programming tasks (WiFi will be turned off).

Course Requirements:

Tests: There will be one Midterm and one Final Exam. Exams will include short questions and/or true/false questions and/or multiple-choice questions and programming problems. All work you submit must be the result of your own individual effort. No Piazza/NYU Brightspace Forum/WeChat group posts during the exam period. Don't share questions or solutions. Don't discuss with your friends or classmates or anyone else. Don't copy solutions from the internet or from others. Under no circumstances would it be acceptable for two or more students to turn in substantially similar answers.

Homework/Programming Assignments: There will be approximately 7-10 homework/programming assignments. These will reinforce the material covered in the lectures and in the textbook and ask you to implement and use of standard data structures. All assignments will be done individually. Under no circumstances would it be acceptable for two or more students to turn in substantially similar answers. We **will drop the lowest homework/programming assignments grade** while calculating averages. Assignment will be announced in NYU Brightspace Assignment Section (http://brightspace.nyu.edu). You should submit your homework in Gradescope.

Online Quizzes: There will be approximately 6-9 online quizzes. These may be held during the regular lectures or recitations classes or outside of class. Each of the quizzes will be approximately 30 minutes long. We will drop the lowest online quizzes grades while calculating averages. Quizzes will be available either in NYU Brightspace Quizzes Section or in Gradescope. All work you submit must be the result of your own individual effort. Don't share questions or solutions. Don't discuss with your friends or classmates or anyone else.
Don't copy solutions from the internet or from others. Under no circumstances would it be acceptable for two or more students to turn in substantially similar answers.

Completion of Recitation Sessions' Tasks: Completion of Recitation Sessions' tasks will be graded. It's okay if you don't find the right solution for the tasks assigned for the Recitation session. We'll see whether you have tried to complete all the tasks mentioned in the Recitation session's worksheets. You may discuss Recitation's tasks with other students in the class, but you may not collaborate on the actual writing or development of solutions. Everyone with whom you discussed set must be cited on the submitted worksheets/python files. You should submit your recitation Python notebook (.pynb) in Gradescope.

Class Participation: Students (~~Temporarily~~ remote, and in-person) are expected to attend all scheduled classes (lectures and recitation lectures) unless the instructor explicitly informs the class that other ways of doing the work are acceptable. Students are also expected to participate during the class discussion. Attendance will be noted and popup quizzes may be administrated during the classes. Students are also expected to participate in the group discussion in NYU Brightspace Discussions. Students are also expected to submit their in-class coding exercises via Gradescope. ~~You can also follow the class asynchronously for valid reasons. Please contact me if you want to follow the class asynchronously.~~ Deduction rules:

- 2% absolute points will be deducted each time when students are found absent for a lecture or recitation without reasonable prior notice and reasons, and approval from the instructors. Same policy applies when students do not submit their in-class coding exercise during lecture sessions.
- A maximum of 4% can be deducted from your final grade due to absence to classes. (See Final Grade formula below)

Grading:

Final Grade = 0.225 * Midterm + 0.35 * Final + 0.175 * Homework /Programming Assignments (dropping the lowest one) + 0.10 * Online Quizzes (dropping the lowest one) + 0.11 * Completion of Recitation's Task + 0.04 * Class Attendance and Participation

I may tweak the formula a little such as changing the weights slightly. Grades will be determined using the following scale:

A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
F	less than 63

You must get a grade of D or better to complete the course.

Homework/Programming Assignments Policy: Your lowest assignment grade will not count towards your average. In return there will be **zero tolerance for late submissions**. Failing to submit your work before the deadline will count for zero credit on that submission. The "1 out of n" policy serves to accommodate all kinds of issues.

All work you submit must be the result of **your own individual effort**. You may discuss homework problems with other students in the class, but you may not collaborate on the actual writing or development of solutions. Under no circumstances would it be acceptable for two or more students to turn in substantially similar answers to a homework problem, or to have possession of each other's homeworks. Everyone with whom you discussed the homework set must be cited on the submitted homeworks. No part of the homework may be copied from or be based on solution sets on the web. Also keep in mind that the solution sets on the web are often incomplete and incorrect.

Any special concern, please contact me before the end of the first week.

Policy on Academic Integrity: Students are expected to read and understand the university's policy on academic integrity as laid out in the Undergraduate Bulletin. Plagiarism and cheating will be penalized.

Midterm exam, Final exam, Online quizzes, Recitation's tasks, and Homework/programming assignments need to be completed individually. In particular, please make sure the submitted works are your own, because MOSS (http://theory.stanford.edu/~aiken/moss/) is pretty good at detecting software plagiarism.

Policy on Make-up of Absence from Class due to illness: When students are ill, they are expected to notify professors in advance of class, if at all possible. Students should negotiate with professors the time and place for make-up of assignments, tests and/or examinations missed. In cases where students are seriously ill and will miss more than a week of classes, the Office of Health and Wellness should be contacted so that the student's other professors may

be contacted. The Office off Health and Wellness will not verify medical absences of under a week.

Moses Center Statement of Disability:
If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Please contact the Academic Resource Center for assistance in registering.

Tentative Topics and Assignments (Subjected to change during the semester)

Week/Date	Topic	Reading	Assignment
Week 1	Python Review and OOP	Chapter 1 and 2	Homework #1 out (Python review, OOP) Recitation #1 due
Week 2	Algorithm Analysis	Chapter 3	Homework #1 due, Homework #2 out (Big-O analysis) Recitation #2 due
Week 3	Recursion	Chapter 4	Homework #2 due, Homework #3 out (Recursion) Recitation #3 due
Week 4	Dynamic Arrays and Amortization	Chapter 5	Homework #3 due, Homework #4 out (Array) Recitation #4 due
Week 5	Stacks and Queue	Chapter 6	Homework #4 due Recitation #5 due
Week 6	Midterm review		Practice exam due
Week 7	Midterm exam	**Chapter 1, 2, 3, 4, 5, 6**	Exam Date will be announced later
Week 8	Linked Lists	Chapter 7	Homework #5 out

			(Linked List) Recitation #8 due
Week 9	Trees	Chapter 8	Homework #5 due, Homework #6 out (Binary Tree) Recitation #9 due
Week 10	Search Trees	Chapter 11	Homework #6 due, Homework #7 out (Search Tree) Recitation #10 due
Week 11	Priority Queues	Chapter 9	Homework #7 due Recitation #11 due Homework #8 out (Heap, Priority Queues, Hash tables)
Week 12	Hash Tables	Chapter 10	Homework #8 due Recitation #12 due
Week 13	Sorting and Selections	Chapter 12	Recitation #13 due
Week 14	Final review		Practice exam due
Final week	Final exam	Chapters 1 to 12, with more focuses on materials after Midterm	Will be scheduled during the final exam week and exact date will be announced later. Please don't make any travel arrangements until you take the final exam.