



UNIVERSITY of HOUSTON

COSC 2430

Data Structures and Algorithms

Course Information

Term and Year: **Spring 2021**
Location: **Online**
Meeting Days/Times: Asynchronous

Instructor Information

Name: **Nouhad Rizk**
Email Address: njrizk@uh.edu
Office Hours: *Tuesday – Thursday 1:00-1:30 Online*

Course Delivery Formats

Asynchronous Online Courses (or asynchronous exam in another course format): This course is taught asynchronously, which means there is no designated day or time assigned to the course (although optional synchronous sessions are possible, such as virtual office hours or discussion groups). Asynchronous instruction generally involves accessing content, such as recorded video lectures, readings, discussion prompts, assignments, and assessments during a flexible time frame, with due dates as specified. This course will have a final exam at the course conclusion. The exam will be asynchronous, and the date and time that it will be released and due will be announced during the course. Prior to the exam, descriptive information, such as the number and types of exam questions, resources and collaborations that are allowed and disallowed in the process of completing the exam, and procedures to follow if connectivity or other resource obstacles are encountered during the exam period, may be provided.

Course Description

Covers the design, analysis, and implementation of data structures and algorithms to solve problems using an object-oriented programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems.

Course Materials

- **Text Book**

Required Data Structures and Algorithms in C++, by M. T. Goodrich, R. Tamassia, and D. Mount, 2nd ed., 2011, Wiley, ISBN 13-978-0-470-38327-8. (Any C++ reference book may be helpful as well.)

Open Book:

<https://open.umn.edu/opentextbooks/textbooks/open-data-structures-an-introduction>

Webcam/camera is REQUIRED for exams

- Reference
- Malik, D S. Data Structures in C++, 2nd Edition, Cengage Learning
- Weiss, Mark A. *Data Structures and Algorithm Analysis in C++*. 4th Edition. Pearson 2014. ISBN-13: 978-0-13-284737-7

- **Compiler**
 - Microsoft Windows Visual Studio 15 or higher
 - GCC 5.3 for Linux
 - Clang or g++ compilers for OS X (check online for latest versions)

Program Objectives

The objective is to prepare students such that within a few years of graduation they will be able to secure for themselves a successful computer science career and contribute decisively to the improvement and development of technology by demonstrating their ability to:

1. Address and solve complex broadly defined problems related to their discipline and field of specialization
2. Work as team members, show leadership, and communicate technical concepts and ideas effectively
3. Manifest a high level of professional integrity, and make ethical decisions that will have a positive impact on the organization and society
4. Embrace and practice lifelong learning, continue personal growth, and professional self-improvement.

Student Learning Outcomes

Based on satisfactory completion of the course, a student should be able to:

- Demonstrate an understanding of basic data structures (such as an array-based list, linked list, stack, queue, binary search tree) and algorithms.
- Demonstrate the ability to analyze, design, apply and use data structures and algorithms to solve problems and evaluate their solutions.
- Demonstrate an understanding of analysis of algorithms. Study an algorithm or program code segment that contains iterative constructs and analyze the asymptotic time complexity of the algorithm or code segment.

Important Notes:

1. **3-Day Policy:** One has **3 days** starting from the end of the class time in which the graded assignment/exam papers have been distributed and/or posted in order to object to the score of that assignment or exam. The objection shall be submitted electronically by emailing the TA and the instructor.
2. **Academic Honor Code:** As a student, you join a community of scholars who are committed to excellence in learning. I assume that students will pursue their studies with integrity and honesty. **zero-tolerance for cheating, whether in exams, quizzes or programming assignments.** Plagiarism, copying and other anti- intellectual behavior are prohibited by the university regulations. Violators will face serious consequences.
3. **Student Conduct:** Disruptive behavior inside or outside class may result in disciplinary actions and academic failure. Students must refrain from disturbing the peace and good order of the university. For more details, please refer to <http://www.uh.edu/dos/pdf/codeofconduct.pdf>
4. **Academic Integrity:** Cheating or any other suspected violations of academic integrity will not be tolerated and will be reported to the Department of Computer Science, Director of Undergraduate/Graduate Studies and if substantiated may result in significant penalty. It is each student's responsibility to read and understand the Academic Honesty Policy found in the Student Handbook (<http://www.uh.edu/academics/catalog/policies/academ-reg/academic-honesty/>).
5. **Plagiarism:** Plagiarism is using someone else's work without proper acknowledgement. This includes getting help from a friend or colleague and online material. When using someone else's work, always cite the source. Plagiarism is considered a serious breach of academic integrity. **Any breach of academic integrity or plagiarism would result in a minimum of one full letter grade reduction over the final score and possible expulsion from university.**

- 6. Mentors can do a replacement quiz / extra; the mentor should send the grade to your TA.**
7. Attendance: Attendance is strongly suggested. It will not be checked, but it might be considered in borderline decisions for the final grade. Students with unexcused absences should not expect additional help outside of class and are still responsible for any material or instructions given in class, for turning in assignments on time, and for taking exams at the scheduled times
8. Make Up: Missed exams will only be rescheduled for excused absences. If advanced notice is not feasible, you have two working days provide me notification. A zero will be assigned for exams due to an unexcused absence. Documentation must be submitted prior to taking a missed exam.
9. Reading: Readings from the textbook will be given out throughout the semester. We will not be able to discuss all of it in class, but you are still responsible for keeping up with these readings.
10. Code Documentation: When assignments are graded, source code may be examined to verify the way a solution was achieved or to award partial credit. It is your responsibility to make sure that your source code is presented in a clear, readable, way.

Expectations

- ✓ Workload: This is a *15-week-three semester credit* course. Students should expect 2.5 weekly hours of classroom faculty instruction, and a minimum of 5 hours of out-of-class student work per week.
- ✓ Lab Work is 10 % of the total grade
- ✓ Students are expected to meet with mentors on Teams for any additional help.

Course Methodology

This course emphasizes the choice and use of appropriate data structures and efficient algorithms in implementing applications. Instructor and students interact directly in class. During the lectures, the instructor discusses the behavior of the data structures and the efficiency of algorithms that operate on the data.

This course will combine traditional lecturing with hands-on exercises to reinforce student learning. Students are expected to attend classes regularly, take tests, and submit assignments and other work at the times specified by the instructor.

The instructor reserves the right to make changes to the course schedule as needed under unexpected circumstances. These changes will be announced in class and on Blackboard.

Week	Dates	Topic	Reading	Extra Problems *
1	1/19 – 1/21	Basic C++ Recursion	Chapter 1 Chapter 2	Extra_1_4_1: C1.7 Extra_1_4_2: R2.12 Extra_1_4_3: C 2.4
2	1/26 – 1/28	Array-Based Implementations Link-Based Implementations	Chapter 3:	Extra_1_5_1: C3.7 Extra_1_5_2: C3.8 Extra_1_5_3: S3.14
3	2/2 – 2/4	Introduction/Analysis of Algorithms	Chapter 4: <u>Wednesday February 3rd DROP DEADLINE</u>	Extra_2_1_1: C4.5 Extra_2_1_2: C4.23 Extra_2_1_3: C4.26
4	2/9 – 2/11	Stacks Queues Deque	Chapter 5	Extra_2_2_1: C5.2 Extra_2_2_2: C5.5 Extra_2_2_3: C5.6
5	2/16 – 2/18	Vectors, Lists + Sorting bubble, selection, insertion	Chapter 6	Extra_2_3_1: C6.12 Extra_2_3_2: C6.17 Extra_2_3_3: C6.20
6	2/23- 2/25	Exam 1 (Tuesday 23rd) Tree	Chapter 7:	Extra_2_5_1: C7.4 Extra_2_5_2: C7.5 Extra_2_5_3: C7.34
7	3/2- 3/4	Priority Queues & Heaps	Chapter 8: priority queues. Binary heaps are covered, and the implementations of priority queues.	Extra_3_1_1: C8.4 Extra_3_1_2: C8.5 Extra_3_1_3: C8.17
8	3/9 – 3/11	Hashing	Chapter 9 hash tables, including the classic algorithms such as	Extra_3_2_1 : C9.12 Extra_3_2_2: C9.13 Extra_3_2_3: C9.14

			separate chaining and linear and quadratic probing,	
	3/16-3/18		Spring Break	Extra_3_3_1 Extra_3_3_2 Extra_3_3_3
9	3/23-3/25	Binary Search Trees AVL	Chapter 10 Emphasis on search trees, including external search trees (B-trees)	Extra_3_4_1:C10.2 Extra_3_4_2:C10.9 Extra_3_4_3:C10.10
10	3/30-4/1	Review Exam 2 (Thursday April 1st)		Extra_3_5_1: Extra_3_5_2 Extra_4_1_1
11	4/6 - 4/8	Sorting and Selection	Chapter 11 <u>Tuesday April 6 DROP DEADLINE</u>	Extra_4_2_1:C11.12 Extra_4_2_2:C11.13 Extra_4_2_3:C11.18
12	4/13-4/15	Graphs	Chapter 13	Extra_4_3_1:C13.5 Extra_4_3_2:C13.8 Extra_4_3_3:C13.26
13	4/20 - 4/22	Graphs	Chapter 13	Extra_4_4_1 Extra_4_4_2 Extra_4_4_3
14	4/27-4/29	Graphs Greedy (Huffman code Optional)	Chapter 13	Extra_4_5_1: Extra_4_5_2: Extra_4_5_3:
	5/3 rd	Last Day of the semester May 3 rd ...NOTHING IS ACCEPTED AFTER THIS DATE	(Regrade)	Extra_5_1_1 Extra_5_1_2 Extra_5_1_3

***Extra problems are optional; you can do up to 5 per week from the suggested problems in the syllabus and from the end of chapters**

ALL HWs, LABS, GA and extras should be submitted to the server

Your username is coscxxxx and the hostname of the server is 2430.cs.uh.edu.

The default password for each account is the person's 7-digit PeopleSoft number followed by the capitalized last initial followed by the capitalized first initial.

Please, change your password soon to something that only you know.

Grading Policy

The final numeric grade is computed based on student's performance in weekly assignments and exams/quizzes. The final numeric grade for the course will be determined as follows:

- ✓ Homework assignments (NO drop of any HW) 25%
- ✓ Lab work (drop the lowest) 10%
- ✓ Exam 1 (Tuesday 2/23) 15%
- ✓ Exam 2 (Thursday 4/1) 15%
- ✓ Final Exam 25%
- ✓ GA Assignment and/or In class Quizzes 10%

ALL EXAMS WILL BE DONE ONLINE USING RESPONDUS LOCKDOWN BROWSER with CAMERA

Grading Merit

A >= 92.5 Excellent	A - >= 89.5 and < 92.5 Outstanding	B+ >= 86.5 and < 89.5 Very Good
B > = 83.5 and < 86.5 Good	B - >= 79.5 and < 83.5 Above Average	C+ >= 76.5 and < 79.5 High Average
C >= 72.5 and < 76.5 Average	C - >= 69.5 and < 72.5 Low Average	D+ >= 65.5 and < 69.5 Below Average
D >= 62.5 and < 65.5 Poor		F < 62.5 Failing

Programming Assignments/ HW with topics(tentative)

HW (NO drop of any HW)	Posted Mondays	Due Mondays
HW 1	Beginning of week 1	Beginning of week 2
HW 2	Beginning of week 2	Beginning of week 4
HW 3	Beginning of week 5	Beginning of week 8
HW 4	Beginning of week 8	Beginning of week 11
HW 5	Beginning of week 11	Beginning of week 13
(regrade)		

Group Assignments with topics(tentative)

GA	Posted (Tuesdays)	Due (Tuesdays)
GA1	Mid of week 4	Mid of week 7
GA2	Mid of week 8	Mid of week 11
GA3	Mid of week 11	Mid of week 14

Kattis Competitions	(Saturdays)	Time
Kattis Competition I	2/27	12-2
Kattis Competition II	3/27	12-2
Kattis Competition III	4/24	12-2

Labs (tentative)

Labs	Posted (Wednesdays)	Due (Wednesdays)
Lab1	Mid of week 1	Mid of week 2
Lab2	Mid of week 3	Mid of week 4
Lab3	Mid of week 5	Mid of week 6
Lab 4	Mid of week 7	Mid of week 8
Lab5	Mid of week 9	Mid of week 10
Lab6	Mid of week 11	Mid of week 12
Lab 7	Mid of week 13	Mid of week 14

Resubmission Policy

Students can resubmit each homework for a regrade in the next 48 hours after the deadline with 20% penalty. Students do not need to notify anybody; the homework will be regraded automatically.

Regrading Policy

No HW will be dropped, however you can repeat any previous homework for a full grade, through final regrading.

Extra programs

Students can submit any program done in the class/lab or from the end of the book chapter as extra program and upload to the server under separate folders.

Each extra program should be in a separate folder's name named as **extra_m_w_n**. (m means the month when the extra was given, should between 1-5. w means the week of the extra was given, should between 1-5. n means the number of the extra, if only one extra was given in that week, use 1, if two were given, use 1, 2, like extra_2_1_1 and extra_2_1_2. The order is important.)

All the extras should be **under the root of your Linux server (upload .cpp and .h files)**

For example the dayType is extra_1_3_1

Overloading extra_1_3_2

Extras are NOT included in the Grading system

Extras are useful when the grade is on the upper end of an interval. For example, if a student has 82.9 upper end of B- and who has done many programs as extras, the grade might be pushed to B. However, if the student grade is 79.5 EXTRAS WILL NOT BE USEFUL

CAPS

Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS (www.uh.edu/caps) by calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the "Let's Talk" program, a drop-in consultation service at convenient locations and hours around campus. http://www.uh.edu/caps/outreach/lets_talk.html

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Center for Students with DisABILITIES. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with anyone without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Syllabus Changes

Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through (specify how students will be notified of changes).

Resources for Online Learning

The University of Houston is committed to student success, and provides information to optimize the online learning experience through our Power-On website. Please visit this website for a comprehensive

set of resources, tools, and tips including: obtaining access to the internet, AccessUH, and Blackboard; requesting a laptop through the Laptop Loaner Program; using your smartphone as a webcam; and downloading Microsoft Office 365 at no cost. For questions or assistance contact UHOnline@uh.edu.

UH Email

Email communications related to this course will be sent to your Exchange email account which each University of Houston student receives. The Exchange mail server can be accessed via Outlook, which provides a single location for organizing and managing day-to-day information, from email and calendars to contacts and task lists. Exchange email accounts can be accessed by logging into Office 365 with your CougarNet credentials or through Access UH. Additional assistance can be found at the Get Help page.

Webcams

Access to a webcam is required for students participating remotely in this course. Webcams must be turned on (state when webcams are required to be on and the academic basis for requiring them to be on). (Example: Webcams must be turned on during exams to ensure the academic integrity of exam administration.)

Honor Code Statement

Students may be asked to sign an honor code statement as part of their submission of any graded work including but not limited to projects, quizzes, and exams: *"I understand and agree to abide by the provisions in the (select: [University of Houston Undergraduate Academic Honesty Policy](#), [University of Houston Graduate Academic Honesty Policy](#)). I understand that academic honesty is taken very seriously and, in the cases of violations, penalties may include suspension or expulsion from the University of Houston."*

Helpful Information

COVID-19 Updates: <https://uh.edu/covid-19/>

Coogs Care: <https://www.uh.edu/dsaes/coogscare/>

Laptop Checkout Requests: <https://www.uh.edu/infotech/about/planning/off-campus/index.php#do-you-need-a-laptop>

Health FAQs: <https://uh.edu/covid-19/fag/health-wellness-prevention-fags/>

Student Health Center: <https://uh.edu/class/english/lcc/current-students/student-health-center/index.php>

Wishing you a pleasant and a fruitful semester