University at Buffalo
The State University of New York

CSE250
Registration #10644
Data Structures
Spring 2017

COURSE INFORMATION

LECTURE: MWF 12:00-12:50P, COOKE 121

4 credit hours (3 credits for lecture + 1 credit for recitation)

RECITATION:
- (A1), TUESDAY, 8:00A
- (A2), WEDNESDAY, 4:00P
- (A3), THURSDAY, 3:00P
- (A4), FRIDAY, 9:00A
- (A5), MONDAY, 3:00P
- (A6), TUESDAY, 9:00A
- (A7), WEDNESDAY, 9:00A***
- (A8), MONDAY, 1:00P

*Recitations are all held in Bell 340.
**Please attend the recitation you are registered in
***A7 is being closed.

INSTRUCTOR INFORMATION

Dr. Andrew Hughes
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- *Office:* 334 Davis Hall
- *Office hours:* 10:00-11:00A

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Office hours and locations for TAs will be kept up to date on the course calendar.

Please familiarize yourself with everyone involved with the course. We will strive to offer a large amount of office hour availability for students to interact with us, the course staff. You should never hesitate to come ask questions in office hours, whether it be a simple/fundamental question, something more advanced that you are interested in, or simply to chat about the material/department/life in general. Remember that you are always welcome with any level of question and should not be shy to ask.

Note: If you need to email course staff, please include **[CSE 250]** at the beginning of the subject line so your email is not missed. Email without this subject or from non-UB accounts will be ignored.

COURSE DESCRIPTION

From the Course Catalog:

> Provides a rigorous analysis of the design, implementation, and properties of advanced data structures. Topics include order notation and time-space analysis and tradeoffs in a list, tree and graph algorithms, and hashing. Surveys library implementations of basic data structures in a high-level language. Advanced data structure implementations are studied in detail. Illustrates the importance of choosing appropriate data structures when solving a problem by programming projects in a high-level language different from the language of CSE 115 and CSE 116; also covers instruction in this language.

This course covers the design, analysis, and implementation of basic data structures and their related algorithms. These topics include:

- C++ syntax and usage
- Asymptotic notation
- Basic data structures and abstract data types
    - Arrays/Vectors/Lists
    - Stacks
    - Queues
    - Heaps
- Sorting
- Binary Search Trees
    - Tree traversals
    - Self-balancing binary trees
- Graph traversals (BFS/DFS)
- Hashing

This list provides a rough overview of the topics that will be introduced throughout the semester:

Lecture	Topic
Week 1 1/30	Course overview, expectations, resources, etc., begin C++
Week 2 2/6	More C++
Week 3 2/13	Asymptotic notation
Week 4 2/20	Basic data structures: arrays vs vectors
Week 5 2/27	Recursion and Lists
Week 6 3/6	Continue lists, iterators
Week 7 3/13	Recursion Runtime and Memory Analysis

Week 8 3/20	---Spring Recess---
Week 9 3/27	Basic data structures: stacks, queues
Week 10 4/3	Binary Trees
Week 11 4/10	Basic data structures: heaps, priority queue
Week 12 4/17	Balanced Trees
Week 13 4/24	Hashing
Week 14 5/1	Graphs
Week 15 5/8	Wrap-up

COURSE PRE-REQUISITES

Introduction to CS for Majors (**CSE 116**) and Discrete Structures (**CSE 191**) should be completed prior to enrolling in this course. There will be assignments with an implementation component that requires prior knowledge/experience with programming. We will also be covering many mathematics concepts that rely heavily on skills acquired in discrete structures (such as proofs and mathematical notations), so plan accordingly if you are not as comfortable with these topics.

COURSE WEBPAGE

This term we will be using Piazza for class discussion and course content. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: https://piazza.com/buffalo/spring2017/cse250/home

Please note the following about the Piazza platform:
1. If you are not comfortable posting with your name visible to everyone, anonymous posting is available.
2. As anonymous posting is available on Piazza, this is a reminder to be respectful to your classmates. Anonymous is never completely anonymous on the Internet.
3. Please do not post sensitive material/questions to everyone on Piazza. You may restrict posts to only be visible to TAs/myself. If you are uncertain, pose a question with restricted visibility and we can always open it to the entire class if it is a general concern.
4. A follow up to the previous point – don't post solutions to Piazza. If you are posting your specific work, please limit visibility. Posting your solutions/code/own work for assignments prior to deadlines may result in academic integrity violations.

You should have received an invitation in your UB provided email to join our course on Piazza. You will be unable to join without being added by the teaching staff.

REFERENCES

Optional text

- M. Goodrich, R. Tamassia, D. Mount, "Data Structures and Algorithms in C++, 2nd Edition." (ISBN: 978-0470383278)

- B. Stroustrup, "The C++ Programming Language, 4th Edition." (ISBN: 978-0321958327 (hardcover)) (ISBN: 978-0321563842 (softcover))

- T. Cormen, C. Leiserson, R. Rivest, C. Stein, "Introduction to Algorithms, 3rd Edition." (ISBN: 978-0262033848 (hardcover)) (ISBN: 978-0262533058 (softcover)) (ISBN: 978-0262259460 (e-Book))

COURSE FEES

There are no additional course fees aside from the course textbook.

STUDENT LEARNING OUTCOMES

#	Upon completing this course, students will be able to…	Student Outcomes (Computer Science/Computer Engineering)*	Assessment Methods
1	compute, compare, and analyze runtime and function growth using asymptotic notation.	(a, j) / (a)	Written Assignments, Exams
2	identify functionality of basic data structures.	(a, i) / (a, c, k)	Written and Programming Assignments, Exams
3	identify the tradeoffs of different data structures, given their implementation. This also includes recognizing which situations benefit or suit the use of one data structure over another.	(a, b, c, j) / (a, c, k)	Written Assignments, Exams
4	use data structures in programming.	(b, c, i, k) / (c, k)	Programming Assignments
5	implement and analyze basic algorithms such as searching and sorting, as well as recursive algorithms, tree traversal algorithms, and graph traversal algorithms.	(a, c, i, j) / (a, c, k)	Written and Programming Assignments, Exams

* The Student Outcomes from the Engineering Accreditation Commission of ABET have been adopted, see http://www.abet.org/, https://www.cse.buffalo.edu/undergrad/programs/cs/abet/so.php, and https://www.cse.buffalo.edu/undergrad/programs/cen/abet/so.php.

PROGRAM OUTCOME SUPPORT (COMPUTER SCIENCE/COMPUTER ENGINEERING ABET OUTCOMES):

0: Not Supported, 1: Minimally Supported, 2: Supported, 3: Strongly Supported

Computer Science ABET Outcomes Support:

Program Outcome	a	b	c	d	e	f	g	h	i	j	k
Support Level	3	1	3	0	0	0	0	0	1	2	1

Computer Engineering ABET Outcomes Support:

Program Outcome	a	b	c	d	e	f	g	h	i	j	k
Support Level	3	0	2	0	0	0	0	0	0	0	2

COURSE REQUIREMENTS

HOMEWORK

The homework assignments through the semester will be composed of:

- Programming Assignments
- Written Assignments

Assignments may be a mix of both, or strictly one or the other. Due to the nature of the content of the course, you may be required to analyze code that you have written, in addition to providing correct solutions to the problems. This will be clearly noted when the assignments come out and the duration of the assignment will be relative to the size of the assignment. Please pay attention to the amount of time that each assignment provides and begin early. There will roughly be 6 to 8 assignments throughout the semester varying from one to three weeks in length.

For homework assignments, we will only be accepting electronic submissions. These will be accepted via our autograding system called Autolab. Projects will be submitted as described in the write-up. Written submissions must be in the form of a PDF. There are two ways to complete your written homework:

- You may typeset your written submissions using any word processor you wish (Microsoft Word and LaTeX are good options). Some web based options for using LaTeX include ShareLaTeX and Overleaf.
- You may handwrite your written submission and then scan it. An easy way to scan is using your phone along with the Scan feature in Google Docs (for Android). If you prefer to scan your documents, you may do so with your own scanner or on campus, the libraries provide scanning services.

Make sure to **double check your assignments before and after submission** to ensure that part of your writing wasn't chopped off or distorted, as the integrity of your submission is your responsibility. Also, if you handwrite an assignment, make sure that you write legibly. You may be deducted points if we cannot decipher your handwriting or your submission is invalid/corrupt/wrong file format.

Late Policy for Homework

The policy for late submissions is as follows:

- Before the deadline: 100% of what you earn (from your best submission).
- One day late: 50-point penalty (lower your earned points by 50).
- >1 days late: 0 points.

From this policy, you will see that all labs must be submitted within one day of the deadline. You will generally have two weeks to complete assignments, released Mondays, and will be required to submit them by Saturday night/Sunday early morning.

You will have the ability to use 3 grace days throughout the semester, and at most 1 per assignment. Using a grace day will be automatically applied to the first 3 instances of late submissions. It will negate the 50-point penalty. Please plan accordingly. You will not be able to recover a grace day if you decide your score was not sufficiently high to want to use one.

Keep track of the time if you are working up until the deadline. Submissions become late after the set deadline. If you are working late, keep in mind that **submissions will close 24 hours after the original deadline** and you will no longer be able to submit your code.

EXAMS

There will be one in class midterm exam and one 3 hour long final exam. The midterm exam is worth 20% of your grade. The final exam is worth 30% of your grade. I reserve the right to change the scaling of the exams.

No makeup exams will be given except in *provably extreme circumstances*. Please note the following additional policies/suggestions with respect to makeup exams:

- Notify your instructor 24 hours prior to the exam via e-mail or telephone (voice mail) if you are going to miss an exam. If it is medically impossible for you to give prior notice, please obtain a note from a physician detailing the period (and the reason) you were medically incapable of communicating with the instructor.

- If you miss an examination because of sickness or similar reasons, visit a physician and obtain a note detailing the period and the reason you were medically incapable of taking the exam.

- The midterm exam dates will be posted as we get closer to exam time. They will be approximately one and two-thirds of the way through the semester. Please plan your travel and other activities accordingly.

- The final exam date is scheduled by the university and is posted under the HUB Final Exam Schedule.

- Exam times are stressful and one could forget about the exam time. Please make sure you arrange for multiple reminders so that you do not forget about the exam(s). This is another reason to religiously follow the course webpage as there will be numerous reminders about the exam when it gets close to the actual exam date.

RECITATIONS

We will be meeting for recitation to go over homework assignments and any questions you have about the material. In addition, the recitations may review or extend lecture and are an excellent environment to ask more individual questions regarding the course material. Attendance in recitation is not mandatory, however, it is highly encouraged in order to perform well.

GRADING POLICY

Here is the split of grades:

- Homework (50%)
- Midterm (20%)
- Final Exam (30%)

Note: I reserve the right to shift part (5%) of the exam grade to the final exam in the event you perform exceptional well on the final.

Here is a rough estimate (rough, as in you won't get lower than this if that is your final average) of the course grades required for the different letter grades.

Percentage score	Letter Grade	Quality Points
90.0% -100.00%	A	4.0
85.0% - 89.9%	A-	3.67
80.0% - 84.9%	B+	3.33
75.0% - 79.9%	B	3.00
70.0% - 74.9%	B-	2.67

65.0% - 69.9%	C+	2.33
60.0% - 64.9%	C	2.00
55.0% - 59.9%	C-	1.67
50.0% - 54.9%	D+	1.33
45.0% - 49.9%	D	1.00
44.9% or below	F	0

Students will also receive **a grade of F if they are found in violation of the academic integrity policy**. Please make sure to thoroughly read and understand the policy for this course.

Incompletes (the grade of "I") will not in general be given. This is reserved for the rare circumstance that prevents a student from completing the work in the course. University and Department policy dictates that an "I" can be given only if both of the following conditions are met: (i) only a small amount of work remains, such as the final exam and one or two assignments, and (ii) the student has a passing average in the work completed. In such a circumstance, the student will be given instructions and a deadline for completing the work, which is usually no more than 30 days past the end of the semester.

Incompletes cannot be given as a shelter for poor grades. It is the student's responsibility to resign from the course in a timely manner if doing poorly. The last day to resign with a grade of R is Friday, November 11 (before 11:59:59pm).

ACCESSIBILITY RESOURCES

If you have any disability which requires reasonable accommodations to enable you to participate in this course, such as recruiting note-takers, readers, or extended time on exams or assignments, please contact the Office of Accessibility Resources (60 Capen Hall, Tel: 645-2608, http://www.buffalo.edu/accessibility/) and also the instructor of this course. The office will provide you with information and review appropriate arrangements for reasonable accommodations.

STUDY TIME

In this course, you are expected to put in significant additional time beyond the scheduled class times. It is expected that for each credit hour for a course, students should typically expect to put in 2 to 3 hours of work each week outside of class. Since this course is 4 credit hours, expect roughly 8 to 12 hours of time outside of lecture and recitation each week.

You may want to consider practicing coding to stay up to date and polish your skills to perform better on coding assignments. This is especially important if you don't feel confident about your programming after CSE 116. Additionally, the concepts and ideas of the theory in this course are not something you can simply memorize and regurgitate. You must understand the ideas and concepts in order to be able to apply them to different problems.

MISCELLANEOUS NOTES

Here are some other policies/suggestions to keep in mind:
1. Your grade will solely depend on your performance in this semester: you will not get any opportunity to do extra work to improve your grade. It is your duty to make sure you understand what is expected of you. This course will require a fair bit of work so if you are busy this semester, please plan accordingly.
2. If there is a genuine reason for re-grading, please contact the instructor within a week of when the graded material is handed out in class/completed in the grader. In particular, if you do not pick up/view your graded material on time, you may lose the opportunity to get back to us within the stipulated time period.

3. Feel free to make up a group of students to work on homework and study the course. Piazza offers a mechanism to search for group-mates. In a course like this it is very important to discuss problems with one another to better study. Teaching is the best way to learn material!

COUNSELING CENTER

Your attention is called to the Counseling Center (716-645-2720 or 716-829-5800), 120 Richmond Quad. The Counseling Center staff are trained to help you deal with a wide range of issues, including how to study effectively and how to deal with exam-related stress. Services are free and confidential. Their web site is:
http://www.student-affairs.buffalo.edu/shs/ccenter/

ACADEMIC INTEGRITY

Academic integrity is a fundamental university value. Through the honest completion of academic work, students sustain the integrity of the university while facilitating the university's imperative for the transmission of knowledge and culture based upon the generation of new and innovative ideas.

- Reference to the university Undergraduate Academic Integrity policy (http://undergrad-catalog.buffalo.edu/policies/course/integrity.shtml).

The academic degrees and the research findings produced by our Department are worth no more than the integrity of the process by which they are gained. If we do not maintain reliably high standards of ethics and integrity in our work and our relationships, we have nothing of value to offer one another or to offer the larger community outside this Department, whether potential employers or fellow scholars. For this reason, the principles of Academic Integrity have priority over every other consideration in every aspect of our departmental life, and we will defend these principles vigorously. It is essential that every student be fully aware of these principles, what the procedures are by which possible violations are investigated and adjudicated, and what the punishments for these violations are. Wherever they are suspected, potential violations will be investigated and determinations of fact sought. In short, breaches of Academic Integrity will not be tolerated.

DEPARTMENTAL STATEMENT ON ACADEMIC INTEGRITY IN HOMEWORK ASSIGNMENTS

The following statement further describes the specific application of these general principles to a common context in the CSE Department environment, the production of source code for project and homework assignments. It should be thoroughly understood before undertaking any cooperative activities or using any other sources in such contexts.

All academic work must be your own. Plagiarism, defined as copying or receiving materials from a source or sources and submitting this material as one's own without acknowledging the particular debts to the source (quotations, paraphrases, basic ideas), or otherwise representing the work of another as one's own, is never allowed. Collaboration, usually evidenced by unjustifiable similarity, is never permitted in individual assignments. Any submitted academic work may be subject to screening by software programs designed to detect evidence of plagiarism or collaboration.

*It is your responsibility to maintain the security of your computer accounts and your written work. Do not share passwords with anyone, nor write your password down where it may be seen by others. Do not change permissions to allow others to read your course directories and files. Do not walk away from a workstation without logging out. These are your responsibilities. **In groups that collaborate inappropriately**, it may be impossible to determine who has offered work to others in the group, who has received work, and who may have inadvertently made their work available to the others by failure to maintain adequate personal security. In such cases, **all will be held equally liable**.*

These policies and interpretations may be augmented by individual instructors for their courses. Always check the handouts and web pages of your course and section for additional guidelines.

DEPARTMENTAL POLICY ON VIOLATIONS OF ACADEMIC INTEGRITY

The CSE Department has a zero-tolerance policy regarding academic integrity (AI) violations.

When there is a potential violation of academic integrity in a course, the course director shall first notify the concerned students. This notification begins the review and appeals process defined in the University's Academic Integrity statement:

> http://catalog.buffalo.edu/policies/course/integrity.html

Upon conclusion of the review and appeals process, if the department, school, and university have determined that the student has committed a violation, the following sanctions will be imposed upon the student:

§ 1. Documentation. The department, school, and university will record the student's name in departmental, decanal, and university-level academic integrity violations databases.

§ 2. Penalty Assessment. The standing policy of the Department is that all students involved in an academic integrity violation will receive an F grade for the course. The course director may recommend a lesser penalty for the first instance of academic integrity violation, and the adjudication committees that hear the appeal at the department, decanal and provost level may recommend a lesser or greater penalty.