

Course Description

Instructor. Prof. Richard Chang <chang@umbc.edu>

Office Hours: Mon & Wed 2:00pm – 3:00pm

Teaching Assistant. Vandana Venkiteswaran <vvenkit1@umbc.edu>

Office Hours: Thu & Fri 2:00pm – 3:00pm

Course Web Page. <http://umbc.edu/~chang/cs641>

Time. Tue & Thu 11:30am – 12:45pm

Textbook. *Introduction to Algorithms*, third edition, Cormen, Leiserson, Rivest and Stein.
MIT Press (ISBN: 0262033844, 978-0262033848).

References.

- *Algorithm Design*, Kleinberg and Tardos. Addison Wesley, 2006.
ISBN: 0-321-29535-8.
- *Algorithms*, Dasgupta, Papadimitriou and Vazirani. McGraw-Hill, 2006.
ISBN: 978-007352340-8.

Prerequisites. An undergraduate course on algorithms is a prerequisite for this class. At UMBC, the undergraduate algorithms course (CMSC 441) uses the same textbook and typically covers Chapters 1-4, Appendix A (Big-O notation, recurrences and summations), Chapters 6–9 (Heapsort, Quicksort, “linear-time” sorts and linear-time median algorithms), Chapter 15 (dynamic programming), Chapter 16 (greedy algorithms) and Chapters 22–25 (graph search algorithms, minimum spanning trees and shortest path algorithms). In addition hash tables and balanced binary trees are covered in CMSC 341 Data Structures. There will be minimal overlap in the material covered in the CMSC 441 and CMSC 641. If you are not familiar with some of these topics, you must have enough preparation to review the material on your own.

Objectives. The objective of this course is to prepare you to learn new algorithms — either from the literature or by designing your own new algorithms. Thus, this class will have you:

1. master advanced algorithm analysis techniques;
2. practice designing "new" algorithms;
3. accumulate the background knowledge needed to read and understand algorithms published in research journals; and
4. develop the writing skills for clear and logical presentation of algorithms..

A secondary goal of this course is to familiarize students with a range of fundamental algorithms.

Grading. Grades will be based upon the following distribution

Homework	30%	
Exercises	5%	10%
Peer Grading	5%	10%
Self-check	5%	
Participation	5%	
Quizzes	50%	

The planned schedule has 12 homework assignments, 20-25 exercises, and 6 quiz topics. However, if a homework assignment or quiz is canceled and not made up (e.g., because UMBC is closed for snow or hurricane), the percentage of each category will remain the same (e.g., homework will still be 30% of your final grade).

The final letter grade is based on the standard formula:

$$0 \leq F < 60, \quad 60 \leq D < 70, \quad 70 \leq C < 80, \quad 80 \leq B < 90, \quad 90 \leq A \leq 100$$

Grades will not be "curved" — that is, the percentages of A's, B's and C's are not fixed.

Lectures. A substantial portion of our meeting time will be devoted to answering questions, going over homework solutions, peer grading and quizzes. To make this possible, some lectures will be delivered asynchronously. You will need to do both: attend the synchronous lectures and watch the asynchronous lectures.

The purpose of the lectures is to explain the parts of the reading that are difficult to understand. *Lectures do not replace the reading.* The ability to read and understand the formal language in an algorithms textbook is a skill that you develop by practice.

Participation. ~~Class participation has been removed as a graded item. Your participation will be determined by how often you ask good questions. You may ask questions during a synchronous lecture using the chat feature. You may also email Prof. Chang with questions about homework and lecture (both synchronous and asynchronous). Emailed questions that cannot be answered by a quick email response (e.g., requires drawing diagrams) will be answered during class time. For full credit for participation, you should aim to ask a good question for about a third of the lectures.~~

Exams. There are no exams. We will use the time slot for the final exam, Tuesday Dec 15 3:30pm – 5:30pm, for make-up quizzes.

Quizzes. Starting Thursday September 24, there will be quizzes every Thursday. The quizzes will be given during the class meeting time. You must turn on your camera during these quizzes. You will hand write your responses on paper, convert your response into a PDF document and submit electronically. (Note: you may not type or use a stylus to create your responses. It must be done with pen or pencil on paper.)

The quizzes will be scored on 6 topics: greedy algorithms, dynamic programming, network flow, NP-completeness and approximation algorithms.

Each quiz will consist of one question (possibly with multiple parts) on pre-announced topics. The questions will require students to solve new problems (i.e., not simply regurgitate of facts). The quizzes are open-book and you may bring notes hand-written on one 8.5x11 inch sheet of paper (both sides).

Quiz Policy. If you do poorly on a quiz topic, you may take a make-up quiz during one of the scheduled make-up quiz times. There are six such make-up quiz times. You can make up a quiz on any prior quiz topic. You must declare your topic by Tuesday before the quiz. Your score for the topic will be the *average* of all the quiz scores on that topic. (Note: if you are happy with your score for a quiz topic, you should not take a make-up quiz because that could *lower* your score.)

In addition, you may bail on a quiz and not submit a response. When you bail, that attempt will not count in the average for that quiz topic. For example, if you score 70% and 90% on two attempts at dynamic programming, your average is 80%. If you bailed on the first attempt instead and scored 90% on the second attempt, then your average is 90%. However, you must be absolutely certain that you have enough make-up opportunities to submit at least one quiz for each topic. Otherwise, you will have a 0 on some topics.

Addendum: students who choose to retake two quizzes during the final exam's time slot must pick two different topics.

Your responses on quizzes must *absolutely* be your individual work. You may consult the textbook and your one sheet of handwritten notes. You may not consult any person, or any online sources.

The very generous quiz policy, which at least doubles the workload for your professor, was designed to give you a better option than cheating. Why cheat when you can retake the quiz? Just do your best, then study more and do better on the retake. If you are really unprepared for a quiz, just bail.

If you nevertheless decide to cheat on a quiz, then you will receive a score of 0 on that quiz *and* all of your past and future retakes on quizzes will be revoked. If you bailed on the first attempt at a prior quiz topic, then you will receive a 0 on that topic. If you assist another student on a quiz, then you have cheated as well. These are intended to be harsh penalties, so just don't cheat.

Self-Check Questions. ~~Self-Check Questions have been removed as a graded item. After each meeting time, there will be a set of self-check questions that must be completed before the next meeting time. These are multiple-choice or true/false questions that should be fairly easy to answer if you understood the lecture.~~

Exercises and Peer Grading. Prior to most class meetings, you will also be asked to complete an exercise. Your response must be submitted online by midnight in PDF. (See homework submissions below for details on PDF submissions.) During class, your responses will be graded by two or more classmates. You will receive a score for your response *and* for peer grading. Some provisos:

- The score you receive for the exercise will be the average of the peer graded scores.
- Prof. Chang and/or the TA will spot check some of the peer grading and make adjustments if the scores given by the peer graders are incorrect.
- If you give incorrect scores, you will lose points for poor peer grading.
- If you alert Prof. Chang that the score you received is incorrectly high, then you can keep your erroneously high score but the graders will lose points for poor grading. (This is to prevent collusion.)
- You will submit your responses anonymously. The graders will not know your identity and you will not know the graders' identity.

Homework. Homework will be submitted online in PDF. You have several options for preparing your responses. You can write on paper and convert to PDF using a smartphone or a scanner.

(This is the recommended method.) You could also use LaTeX (or equivalent) to prepare a document. (Although drawing diagrams could be quite challenging.) If you have a tablet or a 2-in-1 laptop *and* you have some skill with a stylus, you can use one of those. Microsoft Word and Powerpoint are not recommended since they are terrible with math notation.

In any case, *please* use letter size paper (8.5x11 inches) and leave a good margin.

In general, homework must be submitted when they are due. This allows for timely discussion of the solutions and for the graded assignments to be returned before the tests. If you have an excusable absence (e.g., travel for work, conference attendance, medical illness), please make arrangements with the instructor as early as possible.

Homework Policy. You are allowed to, and even encouraged to, collaborate on homework problems. Collaborators and reference materials must be acknowledged at the top of each homework assignment. However, homework solutions must be written up *independently*. A student who is looking at someone else's solution or notes, whether in print or in electronic form, while writing up his or her own solution is considered to be cheating.

Finally, looking up the solutions to homework problems completely defeats the purpose of homework assignments, which is to train a student's mind to think. Students who bypass this training will do poorly on the quizzes. The primary purpose of homework is not to obtain the correct solution — it is to practice thinking.

Sharing. You do not have permission to share any course material with anyone. Do not post this syllabus, homework questions, quiz questions, recorded lectures to Chegg, Course Hero, Reddit, or any site. Do not share any course material with students who are not in this class, because they might in turn post the material. Finding their course materials Chegg makes old professors cranky. You much rather not have to deal with old cranky professors.

The UMBC Graduate School's academic integrity policy is available in [the graduate catalog](#).

Additional UMBC Policies for Fall 2020 on Student Safety, Technology Access, Success in Online Courses and Enrollment Dates are described in [a separate handout](#).

UMBC Policies on Accessibility & Disability Accommodations, Sexual Assault, Sexual Harassment, Gender Based Violence & Discrimination, Pregnancy, Religious Observances & Accommodations and Hate, Bias Discrimination & Harassment are described at the [Office of Equity & Inclusion's website](#).