

Course Objectives. This course has been designed to help you succeed in our Master of Data Science Online program. In particular, we have three subgoals. The first is to develop good programming skills, including testing, debugging, and some basics of programming methodology. The second goal is to introduce fundamental concepts in data structures and algorithms. And the third is to encourage you to think critically.

Prerequisites. This course assumes at least a college semester (or a high school year) of previous programming experience. With this background, you should pick up Python fairly quickly, even if you have not used it before. (And the first assignment is designed to ease you into Python.)

Workload. To accomplish our objectives, the course has set of six modest-sized programming assignments, to be completed using Python. There will be no exams, but there will be small quizzes roughly every other week. These quizzes will contain a variety of questions, some of which assess your ability to deeply understand the lecture material.

We expect most students to spend 5-10 hours per week on this course, but programmer productivity has a notoriously high variance, so some of you will spend much less time, while others will spend more time.

Assignment	Start Date	Due Date (Central Time)
Image Manipulation	January 20	February 6
Evil Hangman	February 6	February 20
Boggle	February 20	March 6
Treaps	March 10	April 3
B-Trees	April 3	April 17
WikiRacer	April 21	May 8

Textbook. There is no required textbook, but there are three supplementary textbooks that might be useful, two of which are freely available.

The first provides a good presentation of many of the data structures that we discuss in this class; unfortunately, the code examples are presented in Java instead of Python, but the prose is quite clear. *The chapters mentioned in the syllabus refer to chapters in this book:*

M. Weiss. *Data Structures and Problem Solving using Java*. 4th Edition. Addison-Wesley, 2006.

The second textbook describes just the most basic data structures, but it also provides some background on Python, so this book would be useful for those of you who are not comfortable programming in Python:

B. Miller and D. Ranum, *Problem Solving with Algorithms and Data Structures Using Python*. Franklin, Beedle, and Associates, 2011.

A digital version of this book is available for free under the Creative Commons License:

Finally, the third book, which we highly recommend, is *the Hitchhiker's Guide to Python*, by Kenneth Reitz and Tanya Schlusser. O'Reilly, 2016. The course EdX page will contain a link to the online version of this book, and we recommend that you minimally read Chapter 4.

<https://www.freetechnbooks.com/problem-solving-with-algorithms-and-data-structures-using-python-t11>

Lecture Contents. We'll cover the following topics, roughly in the following order, although some of these topics are sprinkled throughout the course. Except for the first week, each week's lectures will be made available on the preceding Friday.

1. **Introduction.** Course overview, administrative matters.
2. **Programming Skills.** Xtreme Programming, debugging, testing.
3. **Algorithm Analysis.** (Chapter 5)

4. **Basic Data Structures.** Arrays, Linked Lists, Stacks, and Queues. (Chapters 16-17)
5. **Sorting Algorithms.** Quicksort, Mergesort, Radix Sort. (Chapter 8)
6. **Recursion.** (Chapter 7)
7. **Trees.** Tries, Binary Trees, Binary Search Trees (Chapters 18-19)
8. **Balanced BSTs.** AVL Trees, Red-Black Trees, Splay Trees, B-Trees. (Chapter 22)
9. **Priority Queues.** Heaps. (Chapter 21)
10. **Hash Tables.** (Chapter 20)
11. **Amortized Analysis.** (Chapter 22)
12. **Graphs and Graph Algorithms.** Breadth-first search, depth-first search, Dijkstra's algorithm. (Chapter 14)
13. **Dynamic Programming.**

Course Policies

Group Communication. We will use the Piazza website to communicate with one another. Feel free to use this medium to ask and answer questions, and look here for class announcements. You should receive an email message from Piazza asking you to join the class; if you do not, you can visit the Piazza web site and request to join yourself.

<http://piazza.com/utaustinx/spring2022/dsc395t>

Course Etiquette. We expect each of you to treat online discussions as though you were having a civil, respectful discussion with your fellow classmates in a physical classroom. Please refrain from using profanity or any euphemisms for profanity. Please do not bait others or personally attack others. Please do not use sarcasm in a way that can be misinterpreted negatively. And please do not belabor the same points repeatedly. In short, please respect the right of your colleagues to ask questions and to discuss their opinions about the course subject matter on the discussion board. Violators of these discussion rules will be shut out from all class communications—email, Piazza, and office hours.

Office Hours. Professor Lin will hold office hours through Zoom by appointment only. The TAs will hold regularly scheduled office hours as posted on the Piazza page.

Grading.

Programming assignments	70%
Quizzes	30%

This course will be graded on a generous curve, so you should ignore the letter grades that EdX shows for each assignment. Note also that the programming assignments are not weight equally. For example, the first assignment will be worth significantly less than the others.

Late Policy for Assignments. Unless otherwise specified, assignments are due by **11:59pm Central Time** of the due date. Late assignments will be penalized 10% per day, but you are allotted **six slip days**, where each slip day allows you to submit an assignment late by a day without incurring a penalty. You may use at most two slip days for any one assignment.

Peer grading. The first two programming assignments will have a peer grading component that asks you to grade the programming style of other submitted assignments.

Karma. Our goal is to challenge each of you, so most of the programming assignments provide ideas on optional extensions to the assignment. We refer to this optional work as Karma, because while it will generally not affect your grade (and will not be graded by the TAs), it is good for you. Under rare circumstances, students who have done truly significant amounts of Karma may see their graded increased if they are close to a grade boundary.

Quizzes. Quizzes are open-note, so you may consult any publicly available resource that you wish, as well our lectures and any notes that you've taken. Once you begin a quiz, you will have a limited amount of time to complete it.

Do Not Share Course Materials with Outsiders. Except for the syllabus, the material used in this class, including, but not limited to, quizzes, lecture notes, and assignments, may not be shared with anyone outside of the class without the instructor's explicit permission. Unauthorized sharing of materials promotes cheating.

Academic Integrity in This Online Course

Programming assignments and quizzes are to be done individually. Thus, while you are encouraged to discuss the lectures, readings, and assignment specifications with others, but the work that you submit, including both programming assignments and quizzes, must be entirely your own.

Intellectual dishonesty can end your career, and it is your responsibility to stay on the right side of the line. If you are not sure about something, ask.

We encourage you to use code repositories such as github and bitbucket to provide version control for your code, but **it is absolutely critical that you keep your repositories private**. Looking at other solutions and/or maintaining your solutions in publicly visible repositories are both considered cheating and can result in your being assigned an F for the course. Please follow these rules scrupulously and carefully, as we do check.

Violations of the course policy include (but are not limited to) the following:

- Providing your UT EID to any other person.
- Accessing another student's computer account.
- Collaborating or sharing information with another person regarding the material on any quiz or assignment, before, during and/or after any quiz or assignment.
- Helping another student write or debug their code.
- Recording any quiz or assignment material in any format.
- Failing to properly cite language, ideas, data, or arguments that are not originally yours.
- The public (such that it can be viewed by more than one person) posting of any form of any quiz questions or any assignment.
- Consulting forbidden materials or sources of information, including code repositories such as github.com or bitbucket.org.
- Maintaining your own source code in public repositories at sites such as github.com or bitbucket.org. Such repositories must be marked private.

If you have any doubts about what is allowed, ask the instructional staff.

The University of Texas at Austin Academic Integrity principles call for students to avoid engaging in any form of academic dishonesty on behalf of yourself or another student. Grade-related penalties are routinely assessed (An F in the course is not uncommon), but students can also be suspended or even permanently expelled from the University for scholastic dishonesty. If you have any questions about what constitutes academic dishonesty, please refer to the Dean of Students website or contact the instructor for this course.

You must agree to abide by the Honor Code of the University of Texas. You will not work with or collaborate with others in any way while completing any of the graded course assignments or quizzes.

We will use various tools to detect illicit collusion, collaboration, or plagiarism.

Final Thoughts

How to Succeed in this Course. Read this syllabus, start the assignments early, and ask questions via Piazza. If you get behind, it can be difficult to catch up, so if you have any problems or questions, please contact us as soon *as possible* so that we can help.

No Whining. We welcome feedback and comments about the course, and we will correct legitimate grading errors that are identified in a timely fashion, but whining about grades is counter-productive and will only irritate the instructional staff.

Students with Disabilities. The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-6441 TTY.

Academic Advisor Support. If you have additional questions or require support from an academic advisor, please contact the program coordinator at msdsgradcoordinator@utexas.edu.