COMPSCI 187 Syllabus- Spring 2021

Contents

Our hopes and vision for the course

We envision this course as a supportive and inclusive learning community. We hope that this course will be a starting point for you to develop and deepen your awareness of data structures and programming. Our aim is to provide you with knowledge and skills and inspire and foster your commitment to work towards the goals of your major.

Our specific objectives are to introduce and develop methods for designing and implementing abstract data types using the Java programming language. The main focus is on implementing the operations defined in an interface in an Object-Oriented paradigm. Specific topics include linked structures, recursive structures and algorithms, binary trees, balanced trees, graphs, and hash tables. These topics are fundamental to programming and are essential to other courses in computer science.

Prerequisites: COMPSCI 121 (or equivalent Java experience); basic math skills (R1). The prerequisites for 187 require a grade of B or better in 121; or a grade of C or better in 186. 4 credits.

Who we are

Professors

- Gordon Anderson, UMass CICS teaching faculty member.
- Neena Thota, UMass CICS teaching faculty member.

Graduate Teaching Assistants (TAs)

- Aidan O'Neill
- Fabien Delattre
- Fatemeh Rezaei
- Hayden Carter
- Rumeng Li

Undergraduate Course Assistants (UCAs)

- Ajan Prabakar
- Akash Munjial
- Anurag Gumidelli
- Dan Le
- Long Nguyen
- Saicharan Dadireddy
- Satwik Goyal
- Tengzhi(Tony) Zhuo
- Thanh Phan
- Vinay Ramesh

What you'll learn

You'll learn how to:

1. Analyze runtime efficiency of algorithms related to data structure design.
2. Select appropriate abstract data types for use in a given application.
3. Compare data structure tradeoffs to select the appropriate implementation for an abstract data type.
4. Design and modify data structures capable of insertion, deletion, search, and related operations.
5. Trace through and predict the behavior of algorithms (including code) designed to implement data structure operations.
6. Identify and remedy flaws in a data structure implementation that may cause its behavior to differ from the intended design through debugging and testing.
7. Increase your proficiency in coding: designing, writing, testing, and debugging.

Topic Schedule

(subject to modification- see Moodle for exact schedule).

1. Introduction to Data Structures and Algorithms- Abstract Data Types, Generics
2. Big O Analysis, Searching and Algorithm Analysis- Linear, Binary search
3. Sorting Algorithms- N^2 sorts, Mergesort, Quicksort, Radix sort
4. Lists: singly, doubly linked lists.
5. List applications: Stacks, and Queues- array and linked implementations
6. Trees- Binary Search Trees
7. Balanced Trees- AVL and B-Trees
8. Heaps and Treaps- Priority Queues
9. Hash Tables, Hashing functions
10. Graphs- BFS and DFS search algorithms

How you'll learn

Please note that this course is completely online and there is no requirement to attend any event in real-time; however, there are several opportunities to interact with us in real-time, such as labs and office hours. Please see the "Special note for Spring 2021" in the Labs section below for information on in-person lab sections.

A reliable internet connection and a computer capable of running a recent version of the Java Development Kit is required for this course. For any installation or configuration issues and remote help, please contact IT Support. You can email it@umass.edu (from your UMass email account).

The main components of this course are lectures, labs, projects, quizzes, and the "Programming with Data Structures" online textbook from zyBooks.

1. **Lectures:** Lecture material is delivered in the form of pdf files and Java code examples. Lecture videos are also provided. Lecture material may be accessed at any time. Lecture material parallels the text material, but may expand upon and enrich concepts from the text. You can download starter code and develop on your own or along with the professors during the lecture. This coding work is completely optional and no credit is assigned.
2. **Labs:** Labs allow for the opportunity to explore topics in more detail and develop code that reinforces the topics covered in the text and in lecture. Students complete an activity either individually or in groups. Starter code is provided. Labs are conducted by a TA and UCA and attendance is optional. You are encouraged to attend, work through the lab, and ask any questions during that time. Please attend the lab session you are registered for.

   Special note for Spring 2021: Five lab sections have been designated as meeting "in-person". If you have registered for one of these sections, you may attend the lab in-person at the designated time and location. A TA and UCA will be present to answer any questions you may have about the lab. Attendance is optional, and other than the fact that these labs meet in-person, the in-person labs are run exactly the same as the other, on-line lab sections.

3. **Textbook**: We use zyBooks' "Programming with Data Structures", state-of-the-art learning material, proven effective, and designed to maximize learning while respecting student time. The online textbook has embedded exercises and assignments with due dates.
4. **Programming Projects:** We assign a number of programming projects during the semester. These projects provide you with an opportunity to apply the skills and concepts you learn in the course to more involved coding scenarios.
5. **Quizzes:** Five "Topic Quizzes" will be available during the semester. These quizzes are designed to provide you with an opportunity to test your knowledge of a subset of the course topics and to give you some test-taking practice. The quiz questions are designed to be similar to exam questions you might see on the midterm and final exams. These quizzes are given in Moodle and count for 10% of your total grade. The quizzes consist of various types of questions, some are automatically graded and some, such as coding questions, are to be corrected by the quiz taker. We will provide answers for those coding questions. You will receive credit for taking a quiz, not on the percentage of correct answers you scored. Each quiz tests a subset of the material (see Moodle for schedule). Although you may take the quizzes at any time until the last day of classes, we recommend that you take a quiz shortly after you finish the block of material that it covers. You may attempt the quiz only once, but may review it anytime after you finish.

In this course, we use Moodle, Campuswire, VSCode, and Gradescope systems to enrich your learning experiences. We will also use your **UMass Email account** for important communication. Please make sure you check this account and set up forwarding as necessary.

Moodle

Moodle is a Learning Management System (LMS) used for posting course syllabus, materials, assignments, and grades.

You are enrolled in the Moodle course through Spire. You should have had an account automatically created for you at the beginning of the course. If you are unable to log in to Moodle you should contact the professors.

The Moodle webpage, when expanded, shows the weekly topics and material covered in lectures and labs. Grades will be available through the Moodle gradebook. You should orient yourself with how to find it and stay on top of your grades to resolve any grading issues in a timely manner.

Campuswire

This semester we'll use Campuswire as the main hub for communication. Campuswire has a Class Feed and Chatrooms for you to ask questions. Campuswire is for correspondence about the material in this course or for administrative matters only. All content related questions should be posted on Campuswire and not asked via email to the course staff. If you have strong feelings or opinions, positive or negative, about any aspect of this course, the professors encourage you to let them know in a private post which can be followed up if necessary.

We'll add you to the site at the beginning of the semester and you should visit the site frequently to see updates, or subscribe to email notifications. You can even download the app on your mobile phone.

Please follow these guidelines in your use of Campuswire:

- You should use it to ask technical questions and get advice on projects. But you may **not** post project code or solutions either in questions or answers to others' questions.
- If your post must contain code, you should choose 'Post to Instructors and TAs".
- Your question may already have been asked by someone. Before posting, make use of the **search** feature to see if your questions have already been answered. You should only post after thinking through the problem and clearly articulating your question.
- You are encouraged to help other students with answering questions.
- Please consult the UMass Guidelines for Classroom Civility and Respect: http://www.umass.edu/dean_students/campus-policies/classroom.
- The course staff (professors, TAs, and UCAs) will monitor Campuswire and answer your questions in a timely manner. Do not expect us to provide real-time answers on Campuswire, especially in the last few hours before an assignment is due!
- If a question has already been answered in a previous post we may not respond to you right away (hence it's important to learn to use the 'search' feature).
- If a question does not follow the guidelines above we may not answer it. If we find that a private question is relevant to a larger audience, we may make it anonymous and post it publicly to help others in the course.

Email

In addition to Campuswire, we will occasionally use email to communicate important information, such as exam access times and passwords. Every student enrolled in a UMass course has a Umass email account. Therefore, you are responsible for reading all messages we send via your UMass email account. We do not want anyone to miss an exam because they did not read their UMass email!

You might want to look into setting up message forwarding to your personal email so you do not miss any messages.

https://www.umass.edu/it/support/email/manage-your-umail-account-umail-post-office

VSCode

You will be using the VSCode Development Environment for developing, debugging and testing programming projects. This is free software and you will be given installation and training in its use.

You can read more about VSCode here and also do the Java tutorial.

Gradescope

We will use Gradescope for grading your programming projects and lab assignments. Gradescope allows us to provide fast and accurate feedback on your work. You will be added to Gradescope at the start of the semester. Gradescope will email you with your account details. If you do not receive it, please contact the professors immediately.

Projects are graded automatically using Gradescope autograder. Before the deadline you can submit as many times as you need. The autograder will provide you with some limited feedback on your submissions: does it compile, does it pass the public and private tests, what your score is, etc. It will not tell you which private tests it has run, nor should it. It is your responsibility to thoroughly **test and debug your programs before submission**. Purely relying on Gradescope feedback is not an efficient way to solve problems.

Course Support

Office Hours

Office hours are times when we provide real-time access to the professors and TAs via Campuswire. You do not need an appointment to attend office hours, attendance is optional, and all questions you have about the course are welcome. These sessions will be held during the scheduled lecture times and at other times during the week. Please consult Moodle for the schedule of office hour times. We will schedule office hour sessions at a more convenient time for students who reside in time zones that are far away from Eastern time (EDT).

Learning Resource Center (LRC)

Supplemental resources available to students via the Learning Resource Center in the UMass DuBois Library include: Supplemental Instruction, ExSEL Group Tutoring, and 1:1 Tutoring. Visit the Learning Resource Center website for more details.

Your professors and TAs will also contact Student Success & academic advisors regarding your progress in the course. If you are contacted, please consider scheduling appointments such as tutoring or academic advising. Please email academicalert@umass .edu if you have any questions or need assistance connecting with resources.

Assessment and Grading

How you'll know you are learning

You can track how you are learning by monitoring your grades and activity completion tracking in Moodle. Grades will be available through Moodle and you should check them regularly and review any provided feedback. If you encounter any issues with your grades, please let us know **1 week** past the return of your grades, so that we can investigate. Make sure you address grading issues promptly within a week.

Each assessment component is worth a fixed number of points. At any point during the course you can easily calculate your current grade by the number of points you have achieved with respect to the total number of points you can attain in the course.

- **Programming Projects** (35%) There will be a number of programming projects assigned during the course. There are typically 8 or 9 projects in the summer session. All projects have a deadline.
- **Labs** (10%) Grades on exercises completed in Gradescope.
- **zyBook** (15%) Grades on embedded questions in the text.
- **Quizzes** (10%) Topic quizzes for content review.
- **Exams (15% for midterm, 15% for final)** There will be two exams: one midterm and one final exam. **You must attempt both exams to pass this course.**

Although there is no opportunity for extra credit in this course, don't hesitate to take advantage of the resources listed in the **Plan for Success** section below.

The final numerical cutoff for final course letter grade assignment will be made after all grading is completed. Here is a table of approximate grade thresholds that usually apply:

100.00 %	93.00 %	A
92.99 %	90.00 %	A-
89.99 %	87.00 %	B+
86.99 %	83.00 %	B
82.99 %	80.00 %	B-
79.99 %	77.00 %	C+
76.99 %	73.00 %	C
72.99 %	70.00 %	C-
69.99 %	67.00 %	D+
66.99 %	60.00 %	D
59.99 %	0.00 %	F

Please note that we will not make adjustments to any individual student's grade once the final grades have been calculated. Any rounding is done before the final grades are calculated. There is no extra credit or any other additional work available outside of the assigned material.

How learning is accessible to you

Feel included

We honor UMass's commitment to embrace diverse people, ideas, and perspectives to create a vibrant learning and working environment. In this course, each voice in the classroom has something of value to contribute and each voice in the classroom is valued. Please take care to respect the different experiences, beliefs, and values expressed by students and staff involved in this course.

You are welcome regardless of age, background, citizenship, disability, education, ethnicity, family status, gender identity, geographical origin, language, military experience, political views, race, religion, sexual orientation, socioeconomic status, and work experience.

Although this is an online course, please consult the UMass Guidelines for Classroom Civility and Respect.

Accommodation Statement

It is our goal to provide every student with a high quality learning experience. We invite you to contact us if you have any questions or concerns about disabilities or any issue that may impact the quality of your learning and to provide appropriate documentation to facilitate the implementation of any accommodations.

If you have a disability and require accommodations, you will need to register with Disability Services. Information on services and materials for registering are also available on their website: www.umass.edu/disability.

Exemptions

There can be situations when you cannot take an exam, or submit an assignment by the due date. For example, in the case of illness, religious or funerary events, university-related events (athletic event, field trip, or performance), and extenuating non-academic reasons (military obligation, family illness, jury duty, automobile collision). For religious reasons, you must provide us with a written list of such dates within one week of your enrollment in the course. In all other instances, please provide us with written documentation as soon as possible.

If you add the class late, you are responsible for both notifying us when you join the course, and for completing the work on your own.

Course incompletes will be granted only in exceptional cases, and only if you have completed at least half the course with a passing grade. Prior to that, withdrawal is the recommended course of action.

Plan for Success

Your success in this class is important to us. We all learn differently and bring different strengths and needs to the class. If there are aspects of the course that prevent you from learning or make you feel excluded, please let us know as soon as possible. Together we'll develop strategies to meet both your needs and the requirements of the course.

Extra Resources for Data Structures

Below are some recommendations for helpful texts to read:

1. Introduction to Java Programming and Data Structures, David Liang. This book has great code and visualizations for data structures. The first part of the book contains a thorough review of introductory java concepts.
2. Object-Oriented Data Structures Using Java We have used this textbook for many years, but no longer require it.
3. Data Structures and Algorithms in Java, Michael Goodrich, Roberto Tamassia, and Michael Goldwasser. A bit more technical and complete than the previous book, but we haven't thoroughly reviewed. it.
4. Data Structures and Algorithms in Java, Robert Lafore. This book has great code and visualizations.
5. Java Precisely, Peter Sestoft. This book is intended more as a reference for people who already know the language, but it has both all the details you aren't likely to memorize and a very clear definition of exactly what the language is and what it does.

6. Learning Java, Patrick Niemeyer and Daniel Leuck. A learn-by-example book about Java. You can read it online for free, or buy the e-book.
7. OpenDSA Data Structures and Algorithms - An on-line textbook with good animations.
8. Algorithms and Data Structures - An online chapter with sample code.

Tips for Project Submissions

To ensure that you submit projects on time you should **begin them early** and not wait until the last minute to submit. This way you are prepared if you have last minute internet connectivity glitches. You will be able to submit multiple times, so submit early and often to ensure you have something in before the deadline. Become familiar with Gradescope and verify that your submission has been properly uploaded before the deadline.

Use OneDrive, DropBox, Google Drive, or some other backup software to ensure that your work is not lost in the event of a computer failure.

Follow the Academic Honesty Policy

It is very important in all courses that you be honest in all the work that you complete. In this course you must complete all projects, exams, etc. on your own unless otherwise specified. If you do not, you are doing a disservice to yourself, the professors for the course, the College of Information and Computer Sciences, the University of Massachusetts, and your future.

We design our courses to provide you the necessary understanding and skill that will make you an excellent computer scientist. Projects and exams are designed to test **your** knowledge and understanding of the material. Plagiarism and academic dishonesty of any kind may seem like an easy way to solve an immediate problem, however, it can have a substantial negative impact on your career as a computer science student. Regretfully, we'll have to pursue sanctions (see https://www.umass.edu/honesty/) if we find cases of plagiarism or cheating.

Other course policies

Projects:

1. Projects in this course are **individual**. Discussing the projects with your peers is allowed, but you **must** write every line of code on your own and implement solutions on your own. Copying from other students, either digitally or manually, is strictly prohibited.
2. We check all project submissions for similarity to other student submissions ***and to solutions posted on external websites*.**
3. If you plan to use version control software, such as **Github, GitLab,** or **Bitbucket** to manage your projects, you must make sure your repositories are ***private*** and not publicly available.

Course content:

1. You may not reproduce, distribute, upload, or display lecture slides, lecture recordings, projects,, or labs without the faculty member's permission is a violation of the faculty member's copyright protection.

2. Use of materials from previous offerings of this course, no matter the source, and even if you are retaking the course, is prohibited.
3. Posting materials from this course on websites either during or after this course is prohibited.

Collaboration:

1. While we support learning from your peers, the rule of thumb is that any learning should be in your head. Therefore you should not leave an encounter with another student (in person or electronic) with anything written down (or electronically recorded) that you did not have before. Thus, giving or receiving electronic files is specifically considered cheating.

Wellness and Success

The professors and teaching assistants are eager to help you learn and to work through any difficulty. Please contact your professors for any assistance that you need.

You are not alone at UMass – many people care about your well-being and many resources are available to help you thrive and succeed.

You have resilience and are already using effective strategies to help you achieve your educational goals. Take stock of these and consider what new steps or resources could be helpful. Getting enough sleep, exercising, eating well, and connecting with others are all antidotes to stress. If you are struggling academically, reach out to us prior to deadlines and before the demands of exams, papers, and projects reach their peak.

Connect with one or more of the many supportive resources on campus that stand ready to assist. You matter to us.

Acknowledgments

Some material in this document has been taken from syllabus and related policies from other courses at CICS, UMass.