

## CS 2050-001 Data Structures & Algorithms

Fall 2023

CRN 50382

Mon & Wed, 10 am      AES 220

### Instructor:

Blanche Cohen

cohenb@msudenver.edu

Note: On rare occasions you may receive emails from **blanche@acm.org**

### Office Hours:

2-3 pm Mon and Wed

Bullpen, 2<sup>nd</sup> floor AES (across from faculty offices with doors)

Feel free to email anytime, but no guarantee of immediate response on the weekends. I try to respond within a short time (which is open for definition).

### Description:

### OBJECTIVES

#### **ADMINISTRATIVE INFORMATION**

Students are responsible for full knowledge of the provisions and regulations pertaining to all aspects of their attendance at MSU Denver and should familiarize themselves with the policies found in the MSU Denver Catalog: [MSU Denver Catalog](#). For more information and recent updates, go to the CHAS website:

<https://www.msudenver.edu/las/currentstudents/>

*Student Rights and Responsibilities*

<https://catalog.msudenver.edu/content.php?catoid=35&navoid=2336>

*Student Code of Conduct*

<https://catalog.msudenver.edu/content.php?catoid=35&navoid=2296>

*If this is your first time at Metro, or not familiar with Canvas (CS Dept online learning system) we'll go over it on the first day of class.*

***NOTE: If you have any difficulty accessing the hyperlinks in this document, please inform the instructor.***

### IMPORTANT DATES - University Calendar

Aug 21    Classes Begin

Aug 28    Last day to drop with 100% refund

**Sep 7    Labor Day – no classes**

Sep 6    Last day to drop with 50% refund

**Sep 25    No Class**

Nov 3    Deadline to withdraw, no GPA penalty

**Nov 22    Fall Break begins**

Dec 9    Classes end

Dec 11    Final Exam Week Begins

### OVERVIEW

This course, a continuation of CS 1050 (Computer Science 1), further emphasizes the concepts of the software development cycle and introduces the concept of an abstract data type (ADT). The topics covered include linked-lists, trees, stacks, queues, classes, recursion, and a variety of data representation methods. Further topics in software engineering and programming style as well as algorithms for sorting and searching are included.

## Prerequisites

- CS 1050 (Computer Science 1) and
- MTH 1110 (College Algebra).

All with a grade of "C-" or better, or permission of instructor.

## COURSE FORMAT

This course is offered in the face-to-face format. Therefore, expect to meet with your instructor on campus during normal class times. An absence can be excused only in the case of verifiable emergencies and students are asked to notify the instructor by email prior to the end of class. **Unexcused absents will affect your participation grade.** To facilitate and encourage class discussions, students are expected to read pre-assigned sections of the textbook before class meeting times.

Your success in this class is important to me. We will all need accommodations because we all learn differently. If there are aspects of this course that prevent you from learning or exclude you, please let me know as soon as possible. Together we'll develop strategies to meet both your needs and the requirements of the course.

## ABOUT CLASS ORGANIZATION

This class adopts the modularized structure used by the Canvas learning platform. Each of the learning modules covers one or more specific topic (see Outline of Class Topics, below). You will be given one or more assignments to assess your learning on each of the modules.

Assignments that involve writing code will be shared on the GitHub platform. Students are encouraged to maintain a mirror version of the official GitHub repository for their convenience.

Exams will cover multiple modules and will be administered during class sessions. Make-up exams will only be allowed for illness and other verifiable emergencies. Either way, students need to contact the instructor prior the exam date.

If you have an accommodation letter that authorizes you to take exams at the testing center, you also need to contact the instructor prior the exam scheduled date for arrangements. **Exams at the testing center will have to start at the same time as the regular schedule time.**

## REQUIRED MATERIALS

Eck, D., [Introduction to Programming Using Java. 8th Edition](#)

Morin, P. *Open Data Structures* (in Java). 0.1G Edition.

Available online at: <http://opendatastructures.org/ods-java.pdf> This is an external link..

Supplementary material, including this syllabus, the class schedule, slides, papers to read, and assignment instructions will be made available through Canvas. This Learning Management System (LMS) is also where you will submit your work and check your grades. Expect to be asked to configure development tools and libraries throughout this course. Link to tutorials will be provided to you.

## Course Learning Objectives or Outcomes

Upon completion of this course the student should be able to:

- Describe the concepts associated with an Abstract Data Type (ADT)
- Create appropriate ADTs for specific applications.

- Differentiate between static and dynamic data structures.
- Implement array and linked lists.
- Describe stack and queue modes of operation.
- Implement stacks and queues.
- Describe general trees, binary trees, and binary search trees (BSTs).
- Implement BSTs using recursive procedures.
- Write code to perform different forms of tree traversal.
- Implement simple sorting and searching algorithms.
- Determine the order of complexity of sorting and searching algorithms.
- Implement hash tables.
- Produce appropriate unit tests for a given method/procedure.
- Write program documentation that includes appropriate preconditions and postconditions.

## LEARNING INTERACTIONS

Learning interactions take place in the form of written homework assignments, interactive in-class problem solving assignments, slide presentations, reading of designated sections of the textbook, and additional resources.

Interactive problems sessions and discussions will also take place during in-class group activities that prioritize learner-learner interactions.

**Distraction-Free Classroom Statement:** An utmost priority in my classroom is to maintain a **distraction-free classroom**. The following items are common classroom distractions we **need to avoid**:

- Use of smartphones (or other portable electronic devices) during class or leaving the classroom at inappropriate times to use these devices. **Please turn phones OFF** during class and put away headphones.
- Arriving at class late (or leaving early) for avoidable circumstances and failing to enter (or leave) the classroom discretely for unavoidable circumstances.
- Attending class unprepared. We have regular activities that require the use of a (portable) computer. If you don't have a computer, contact the instructor so you can borrow one.
- Socializing that is not related to course content. Lectures will not be our only activity and socializing is acceptable during some classroom activities but discussing topics unrelated to our classroom activities is not allowed.

## COMMUNICATION AND INTERACTION POLICY

The best way to communicate with me is through email. I also use email to send announcements to my students. For your convenience, the subject of those emails will always be prefixed by "CS 2050". Please let me know how do you prefer to be addressed by me.

## CREDIT HOURS

Federal Credit Hour Definition: A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a **minimum** of two hours of out-of-class student work each week for approximately 16 weeks for one semester.

***This works out to 64 hours of class time and a minimum of 128 hours outside of class for the semester.***

## PREPARATION & PARTICIPATION

All students are expected to prepare in advance for class sessions (by reading, doing preparatory exercises, etc.) and to participate in all class activities and discussions. ***Participation in class activities and discussions is mandatory and constitutes part of the overall assessment of performance in the course.***

The books and references do *not* provide all of the information necessary to successfully complete the course. Significant information is presented during class sessions or via the course websites. You are responsible for knowing this information whether or not you attended the sessions and accessed the websites.

In addition to important domain and course information, the course Canvas website is also the vehicle for managing assignments and assessment.

Practice is vital to applying course knowledge to the real world. Assignments represent the opportunity to practice applying the concepts and enhance your understanding. Details are provided in class and on the course website.

Learning and utilizing **team-oriented collaboration** skills and practices are fundamental to the study of computer science and thus **expected in this course and part of the assessment**. Group work represents a significant aspect of this course, so please be considerate of your colleagues if you think you may drop so as to reduce the adverse impact on them.

### ***ASSIGNMENTS, ACTIVITIES, PROJECTS***

Assignments, activities, and projects are opportunities to practice applying the concepts, to enhance understanding, and to demonstrate knowledge and the ability to apply such knowledge.

Details regarding assignments and projects are provided in class or on the course websites. Assignment specifications explicitly state submission requirements. These include required use of website submission form fields (e.g., "Online text") and the number, type, and names of uploaded files.

### ***GENERATIVE AI CONSIDERATIONS***

Well, you knew this was coming, right?

Among the many topics, we will discuss and use Generative AI applications, both to create and evaluate assignments. The level of use will depend on the assignment. The University has developed (talk about a moving target....) recommended policies. The specific use (option) will be specified in each assignment.

Options	Suggested syllabus language (short version)	Suggested syllabus language (detailed version)
<b>Option 1</b> <b>"Allowed"</b> (use of generative AI is generally allowed or encouraged)	Students may use generative AI in any assignment in this course. All use of generative AI must be cited/explained.	Students are free (and even encouraged) to use generative AI in all aspects of the course.  Generative AI can be used when and wherever the student feels it is appropriate to enhance their learning.  If generative AI is used as part of work that will be submitted, its use should be briefly but accurately explained in a submission statement.
<b>Option 2</b> <b>"Mixed"</b> (distinct parts of the course forbid, allow, or encourage the use of generative AI)	Using generative AI is encouraged in some aspects of this course, allowed in others, and prohibited in some. The instructions included with every assignment will address the use of generative AI. When used, you will be asked to briefly but accurately explain how in a submission statement.	The use of generative AI is encouraged in some aspects of this course, allowed in others, and prohibited in some.  Students are encouraged to explore any and all tools that help with their learning, including the use of generative AI.  If generative AI is used as part of work that will be submitted, its use should be briefly but accurately explained in a submission statement.  In creating submissions, generative AI may be used in specific parts of the coursework. - Help in generating an outline for a piece of writing. - Getting feedback and editing help on your original writing. - Etc.  The following assignments should be completed without the use of generative AI. - Reflection essays - Responding to classmates in a discussion forum - Answering questions on any quiz, test or exam. - Etc. The use of generative AI in these cases will be treated as a violation of academic integrity.
<b>Option 3</b> <b>"Restricted"</b> (use of generative AI is generally forbidden)	Students may only use generative AI in this course when an assignment explicitly calls for it. Use in any other assignment will be treated as academic dishonesty.	The use of generative AI is restricted to rare and specific circumstances in this course. Students should not use such tools unless they are specifically called for in an activity, assignment, or assessment.  Any use of generative AI in the creation of submitted work for this course will be treated as a violation of academic integrity.

## DELIVERABLES

### *Online Submission via Website*

Assignments must be turned in using the course Canvas website unless explicitly specified otherwise. In particular, ***email and hardcopy will not be accepted in lieu of website submission without instructor approval.***

### ***Due Dates/Times***

An assignment may be submitted at any time *prior* to the published due date/time.

N.B. **Assignment submissions are not accepted after the published due date/time.**

Early completion of draft submissions is encouraged and requests for feedback on drafts are accommodated when feasible.

Because there are so many risks to assignment completion and submission, you are strongly encouraged to target completion and submission of assignments *no less than 24 hours prior to the published due date/time*. Computer systems and networks commonly experience "down times". Do not depend on systems, including the course support servers, to be consistently available immediately preceding a deadline. In addition, the instructor may not be available to address questions regarding a specific assignment in the 24 hours preceding its deadline.

Illness, crises, and emergency situations will be dealt with on a case-by-case basis in accordance with University, College, and Departmental policies.

### ***Requirements-Based Scoring, Deliverable Formats, and File Naming***

Assignment descriptions explicitly state necessary submission requirements, both content and structure, including appropriate use of assignment submission fields and the names and types of uploaded files.

## **COLLABORATION & CITATION OF SOURCES**

*Collaborative activity is required for successful completion of this course.* In particular, collaboration is regarded as an essential aspect of computer science and contributing to the community of learners. Collaboration and discussion with fellow students, instructors, and university resources (such as the [Writing Center](#)) is strongly encouraged. You are neither expected nor advised to learn the course content or work on assignments and projects in isolation.

Much of the work in this course will be collaborative in nature. That said, in order to provide fair and meaningful assessment for grading, the work you turn in must reflect your own efforts. You must create your own submissions, reflecting your individual effort, for every assessment item submitted, whether or not the outcome resulted from collaborative effort.

Team deliverables are expected to be a joint effort involving *the* collaboration and contribution of *all* team members. An overall evaluation will be made for each deliverable that reflects the quality of product or artifact. An individual grade for each team member will be assigned for each deliverable. You may be expected to assess each team member's contribution, including your own.

- In every submission, you *must* credit the people with whom you worked or consulted.
- If you consult any sources (people or works), your submission *must* explicitly reference those sources and indicate where and how they apply.
- If you include direct quotations *or* derivatives (text, graphics, program code, etc.), your submission *must* include explicit citations that identify the sources.

## **YOUR RESPONSIBILITIES:**

- Assignments, links to software for download and additional material is on Canvas and other sources as identified.
- Check class website daily for updates, assignments, etc.
- Check your email daily for any relevant changes in schedule, readings, assignments, etc.
- Keep up with the assignments and reading.
- If you need help, contact me as soon as possible. New topics build on previous topics.
- Feel free to help each other *learn the concepts* but assignments must be your original work.

**GRADING:**

*Grades will be based on homework, participation, and exams.*

Individual activities	50%
Group Activities	30%
Exams (2)	20%

Please note: Attendance is not part of grading. You do not get brownie points for showing up. In the real world, you get paid for showing up and doing the work.

***Point Grading***

A: 90-100%

B: 80-89%

C: 70-79%

D: 60-69%

Anything else: F

**CHEATING**

You must not claim the work of others as your own. If you use the work of others, you must properly cite it. In programs, modifications to other's programs such as renaming variables, reordering methods, etc., is still cheating. If you cheat once, you will receive a zero on that assignment or test; if you cheat twice, you will be reported to the department chair and Student Conduct in the Dean of Students Office and will result in at least an F in this class. If you have any questions as to what constitutes cheating, please contact me.

**ATTENDANCE POLICY**

Do not participate in class unless you are ready and willing to learn.

**CLASSROOM BEHAVIOR**

This is a university classroom and not only are you students, but you are also adults. I will treat you as adults. If you have a question, ask it in class, as it is my experience that if you have a question, most of the other students do too. If online using Teams, please remember to mute your microphone if you're not talking. Noise in the background (such as my dog) is very distracting.

**SUBMITTING ASSIGNMENTS**

Assignments will be submitted on the Canvas website. Details will always be specified in the assignment itself. If you haven't used Canvas before, we'll go over it in class the first week.

**HOMEWORK EVALUATION CRITERIA**

- Only plain text unless otherwise specified.
- I will NOT accept links to OneDrive or GoogleDocs or any other 3<sup>rd</sup> party source.
- Assignments will be submitted to Canvas (details the first day of class) or otherwise *as stated in the assignment*.