CSC 236: Data Structures Syllabus - Spring 2025

Instructor and TA Information

Instructor:: Dr. Jan Pearce **Email:** pearcej@berea.edu **Office:** CMIT 309 **Student Hours:** MWF 1:20-2:00 pm, T 2-2:50 pm, and via https://calendly.com/drjanp/.	**TAs**: Bryanna Erickson **Evening Lab Hours** Monday 7:00 - 9:00 pm Tuesday 7:00 - 9:00 pm Wednesday 7:00 - 9:00 pm Thursday 7:00 - 9:00 pm Additional support: **Slack Channel #csc236**

Email and Slack are typically good ways to reach me, but please also feel welcome to drop by my office anytime my door is open. Important note: For general course questions, please never use email or private Slack messages to any of us. Instead, please use our course Slack channel, which makes it possible for others to answer. Making effective use of our course channel will count in your participation grade while using private communication channels for questions that might have helped others will negatively affect your participation grade.

Course Description:

The design and implementation of software is fundamentally about tradeoffs between how fast our code runs and the amount of memory it consumes while running. This course explores the common structures used to represent data (classes, queues, linked lists, trees, and hash tables, to name a few), the design tradeoffs we must make when choosing between various data structures, and the analysis of our algorithms and structures when expressed in code. This course continues the study of software design and implementation from an object-oriented perspective, and we will begin the course with a transition from the dynamically typed scripting language, Python, to the statically typed systems language, C++.

Why would anyone really care about data structures?

In this course, you will learn how it is possible that a computer that is substantially slower than another computer can solve an identical computational problem substantially faster simply through the more effective use of data structures and/or better algorithms. Sometimes the amount of this speedup is quite literally mind-blowing!

Resources and Texts

- ***C++ for Python Programmers*** by Jan Pearce and Brad Miller, and ***Problem Solving with Algorithms and Data Structures Using C++*** by Brad Miller, David Ranum, and Jan Pearce. These are both interactive books published by and freely available at https://runestone.academy. Sign up with your Berea email, and join the given version of the book. **Note that readings done in generic or older versions of these books cannot be given reading credit, so be sure you are signed in when doing your reading!**

- The CSC 236 Data Structures website is located at https://berea-college-csc236.github.io/

Learning Goals:

Students who successfully complete this course will:

1. *Learn to process information efficiently:*
   Learn innovative and analytical in approaches to the handling of data:
   a. Appreciate the reasons for breaking a larger task into smaller subtasks and incrementally and methodically designing algorithms and effectively using data structures.
   b. From other disciplinary contexts, identify application opportunities for the effective use of important data structures such as classes, pointers, hash tables, linked lists, stacks, queues, and trees.
   c. Recognize and be able to explain the impact of design tradeoffs of different data structures and algorithms in applications.
   d. Develop skills in the C++ language, and be able to explain differences from Python.
2. *Learn to communicate and collaborate effectively:*
   Cultivate effective communication with peers as well as thorough code:
   a. Write readable C++ code that meets design requirements and that both you and others can understand.
   b. Be able to read, understand, and modify pre-existing C++ code.
   c. Value effective collaboration with other team members.
3. *Learn to learn and to problem solve:*
   Develop confidence, tenacity, and resilience in acquiring and constructing new knowledge when you need it:
   a. Develop skills in locating and utilizing resources.
   b. Develop faith in their own resourcefulness and learning abilities.

What do employers want?

You may notice that not all of the above learning goals are technical. Regardless of whether you plan to go to graduate school first, most of you will want to find employment sooner or later. Employers responding to the National Association of Colleges and Employers (NACE) Association's Job Outlook survey[1] rated the following as the top skills employers look for in new hires:

1.	Problem-solving skills	91.2% of respondents
2.	Ability to work in a team	86.3% of respondents
3.	Strong work ethic	80.4% of respondents
4.	Analytical/quantitative skills	79.4% of respondents
5.	Communication skills-written	77.5% of respondents
6.	Leadership	72.5% of respondents
7.	Communication skills-verbal	69.6% of respondents
8.	Initiative	69.6% of respondents

[1] Key Attributes Employers Want to See on Students' Resumes (2020), National Association of Colleges and Employers, https://www.naceweb.org/talent-acquisition/candidate-selection/key-attributes-employers-want-to-see-on-students-resumes/

Software and technologies:

- Visual Studio Community 2022 (required), Git (required), Github (required)
- Online Help: Slack Channel #csc236-s44

Technology Expectations

The following policies are designed to guide students in how to be effective in a technology-rich environment.

- **Laptop and Software**: Each student is required to have an appropriately equipped laptop and software for class. Your Berea College-issued laptop is sufficient.
- **Communication**: Electronic communication programs are useful when used appropriately, so each student is required to use the course website, Moodle, Slack, and particularly *your Berea College email account* to facilitate communication outside of class. **We expect you to check your email daily, so if we email something on Monday, you should know it well before Wednesday's class, and it should not come as a surprise to you.**
- **WiFi:** If the College returns to virtual classes, this class will run synchronously and you will be required to attend with your video feed on. This means you will be required to both have a working video camera and adequate WiFi bandwidth. Hopefully, this will not happen…
- **Backups**: All students are expected to regularly backup their work, which includes assignments, quizzes and exams. We use Google Drive extensively in this class; learn how to use it to back up all of your work (for this and other classes). It will take you less than 30 minutes to set up, but it will save you hours of work if your computer crashes. Your normally-understanding instructors will not be sympathetic to your loss, as you have all the tools available to you to prevent such heartbreaking loss.
- **Unapproved Technology**: The in-class use of unapproved technology will not be tolerated, and in certain cases will constitute a violation of academic honesty. For example, no games are ever acceptable, and communication tools, such as cell phones, email or instant messaging programs, are only acceptable when being used for course-related work. To help students appreciate the gravity of this policy, each in-class use of unapproved technology will result in a 1% reduction of the student's final grade or academic honesty action, when appropriate.
- **Plagiarism and Academic Honesty**: Plagiarism is the use of anyone else's work or ideas and claiming them as your own. This INCLUDES work that leverages AI tools! Plagiarism is a crime which is both easy to commit, and easy to avoid. **All** ideas taken from AI tools or other people, including those from books, articles, websites, TAs, or your friend's homework must be cited. The best way to avoid plagiarism is to **cite ALL your sources, always**! If you are not sure whether or not to cite a source, **you should cite it!** Simply put, plagiarism is stealing because it constitutes theft of someone else's ideas. It is a serious offense, and Berea College takes it very seriously. **Plagiarism will not be tolerated!** At the first offense, the student will receive an F for that assignment. At the second offense, the student will fail the course. ALL offenses of plagiarism will be reported to the Director of Academic Services, as detailed in the Berea College Student Handbook. The easy way to avoid problems is to cite all of your sources.

Course Material

Course material is structured in a way that it supports your learning of a particular skill, from the very basics to a level of expertise. Every activity we do in this course is mapped to an explicit category:

quiz, teamwork assignment, homework assignment, lab, final project, or exam. Each category aligns to Bloom's Taxonomy of Learning[2], a widely accepted model for teaching and learning, and described below.

Reading Assignments and Potential Quizzes

At the most basic level of Bloom's taxonomy of learning is **knowledge**, the ability to recall information. We need you to come to class having completed the preparation needed for the intended learning. All Reading Assignments are due before 8 am on the due date. Participation credit will be awarded for this preparatory work, and sometimes quizzes will follow. None of these quizzes will be announced, but they should always be expected. Reading quizzes are simply designed as a check that you have done the reading. Questions about the reading are very strongly encouraged to be submitted via Slack before 8 am, and making effective use of our course channel will count in your course participation grade. Effective use of Slack can be asking good questions or answering other people's questions. Quizzes will include questions relating to the reading assignment for that day's lesson. Note that questions will not be accepted verbally that were not posted in Slack before 8 am, but they may be asked verbally at any other time, just not verbally before a quiz. This is to encourage good study habits, so if you have a question, post it! Students will take all quizzes individually at the start of the class period. After everyone has completed taking the quiz individually, students will take the quiz again in groups, coming to consensus on the answers to each of the questions. Thus, evidence that you have engaged and retained the information you have read will be reflected in your quiz scores. By keeping track of group and individual scores separately, you will have measures of your ability to listen and to learn from others.

Homework Assignments

The next two levels of Bloom's taxonomy are **comprehension**, the ability to grasp the meaning of the material, and **application**, the ability to use the material in a new situation or see the information in a wider context. Homework assignments are to be completed individually, they never collaboratively.

Teamwork Assignments

Teamwork assignments deepen **application**. In teamwork assignments, you will take your learning from the reading and apply it to a simple, atomic problem. Teamwork assignments are, obviously, completed in teams of two to four, depending on the assignment. Teamwork assignments are always an **in-class activity**, and you are rarely expected to complete the assignment outside of class. If a large portion of the class does not finish an assignment by the end of a class period, that's okay. We'll continue in the next class. We will use Google Drive extensively in teamwork assignments, so make sure you always have your laptop with you.

Generative AI Use Policy[3]:

Generative AI is permitted and even encouraged in ways that support learning and thinking, with proper attribution, but is prohibited in other ways that short-circuit learning.

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[2] Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals: Cognitive Domain*. Longman.

[3] This policy was partially drafted by ChatGPT utilizing two different prompts and significant editing. See https://chat.openai.com/share/0aaf8cca-5d57-4438-832f-8e02cc277b02 for the full chat.

Students are allowed, encouraged, and even required to use Generative AI in some ways but are prohibited from using it in other ways. Keep in mind that any content produced by generative AI can produce false information (called "hallucination," but students remain responsible for ensuring the accuracy of any and all AI-generated content. In-text citations and references should all use the APA style. For more information and an example on correctly citing AI, please see https://apastyle.apa.org/blog/how-to-cite-chatgpt.

Students are permitted and encouraged to use generative AI in the following ways:

- **Brainstorming:** You may use generative AI to stimulate creativity, generate ideas, or brainstorm topics for papers, presentations, and discussions. The generated content must serve as a steppingstone, but never as a final product.
- **Citation Assistance:** AI tools can be used to manage, format, and organize citations and references, promoting adherence to academic writing standards and specific style guides required for individual assignments.
- **Grammar and Style Checking:** AI-powered writing enhancement tools may be used to help with spelling, grammar, syntax, and stylistic errors.
- **Concept Understanding:** Generative AI can be used to explain or simulate concepts taught in class, aiding in a deeper understanding.
- **Research Assistance:** AI can be used to conduct initial research, compile data, and summarize articles, books, or papers. It should never replace traditional research methods but rather help initiate and enhance them.
- **Producing Code from Comments:** Unless specifically disallowed, using Github Copilot as a generative AI tool in this course IS allowed, but ALL use must be documented as described in this policy. Engaging with generative AI tools can provide valuable insights and aid in both programming and learning. However, relying solely on someone else's solution without attempting to understand the underlying principles can damage your learning and hinder your development as a computer scientist. Hence, using Chat GPT is very strongly discouraged because it will not in general help you to learn, while Github Copilot will help you to learn if used via comments that give the logic. Make sure to use tools such as AI and Stack-Overflow as learning aids rather than shortcuts. Be sure you invest time in understanding the generated outputs. When you utilize generative AI tools to assist in your work, it's also important to be transparent about it, so the expectation in this course is that ALL use will be documented regardless of whether the assignment is a program or not. See the footnote to this section of how to document writing that is not code.

You may not use generative AI in coursework in the following ways:

- **In-class work:** Unless specifically allowed, AI is NOT allowed to be used in class on teamworks or other in-class work because these are designed for development of your understanding.
- **Plagiarism:** Using AI-generated content as your original work without attribution. This includes any portion of any essay, paper, presentation, or exam answer.
- **Misrepresentation of Skills:** Using generative AI to complete tasks that are meant to assess your knowledge and/or skill.
- **Writing code from the requirements**: If you simply ask AI to produce code directly from the requirements, this is plagiarism and a misrepresentation of your skil. This si forbidden.
- **Data Manipulation:** Using any AI tool to alter data or create misleading information.
- **Confidentiality Breach:** Using AI tools that might violate KIIS/university policies or laws related to data privacy and confidentiality.

Metacognitive Reflection. In addition to a proper citation, the student should include the following statement with any assignment where generative AI is used for assistance.

"I used generative AI [INSERT NAME OF PLATFORM, SUCH AS CHAT GPT] for assistance in the following ways on this assignment: [INSERT WAYS USED, such as brainstorming, citation assistance, grammar and style checking, concept understanding, and research assistance, etc.]."

Labs

Labs move us to the next two levels of Bloom's taxonomy, **analysis**, the ability to break an idea down into parts, and **synthesis**, the ability to reassemble parts back into a whole idea. In labs, we expect you to explore the ideas from the teamwork assignment on a new, harder, more open-ended problem, and use the learning from other parts of the class to assemble your solution to the problem. You will need to be able to think independently on many of the labs because only some of them are collaborative. You are always encouraged to seek out help from others, particularly from the Slack channel and the evening lab, but also your classmates, the instructor, and outside resources that are NOT a solution to the problem. **However, you are also expected to give credit for assistance (through citations and acknowledgement in supporting materials and in your code).** Again, if you are unsure if you should attribute credit, do it! **If it was not your idea, cite it!**

Final Project

The class will conclude with a final project, and explore Bloom's highest level, **evaluation**, which is the ability to judge the value of an idea for a given purpose. Details about the project will be announced approximately one month before the end of the semester. We will use the final exam period to demo all of the projects. Although you do not have an exam that day, you are expected to attend the final demo, and it will negatively impact your final project grade if you miss it. **Plan accordingly–do not buy a plane ticket home or make arrangements to leave campus before the final exam period unless the entire College has gone virtual.**

Exams

The activities above *formulate* your learning. The two exams will *assess* that learning. The most likely, **tentative dates,** of the two exams are:

- **Exam 1**: Monday, February 17, 2025
- **Exam 2**: Monday, April 14, 2025

If you need accommodations, please alert us that we need to make them well before the exam through the Office of Disability & Accessibility Services, which we've included information about at the end of this syllabus.

Grading

For the benefit of the students in the class, all course grade computations are continually updated in Moodle by the instructor and/or teaching assistants, so students may check frequently on their in-progress course grade during the term. Moodle is an estimate of your grade; your final grade will closely reflect, but may not match perfectly, what is reported in Moodle.

The Berea College grading scale makes clear that:

- An A represents excellent work,
- A B represents good work, and
- A C represents competent work

Most work that any of us do is competent. We will communicate with you regularly about where you stand in the course via Moodle, so that you can focus your efforts appropriately, however, you should always feel welcome to inquire about your grade.

Participation	5%
Quizzes	20%
Assignments	5%
Teamwork	10%
Labs	10%
Exams (20% each)	40%
Project	10%

- An A- or an A is in the range of 90% to 100%
- A B-, B, or B+ is in the range of 80% to 89%
- A C-,C, or C+ is in the range of 70% to 79%
- A D-, D, or D+ is in the range of 60% to 69%
- An F is a grade of 59% or lower.
  Note that grades with pluses are in the highest end of the range, and minuses are in the lowest end of the range.

Questions regarding grades should **never** be directed at TAs, but instead **always** directed to the course instructor. All questions on grades must be asked within one week of an assignment's return. Questions coming outside of this timeframe will only be addressed at the discretion of the instructor.

Attendance Expectations

Class time is considered to be vital to success in this course. Attendance is expected at every class session. Your health and safety matter greatly to us. If you are ill, we ask that you work with us to attend class remotely rather than in-person to the extent that it is both possible and reasonable. Students who come late, leave early, or fail to fully participate during the class will be considered absent for that portion of the period, and such partial absences will accumulate. The final grade may be lowered by one-third of a letter grade (i.e., 3.33%) for each unexcused absence beyond the third. **It is the responsibility of the student to contact the instructor about EACH absence from class.** In most cases, this should be done via Slack or email to the instructor, as soon as possible, and if at all possible, before the absence occurs. Students who miss class are held responsible for all of the material covered, assigned, and collected during their absence. If you are sick with flu or COVID-19 symptoms, the Center for Disease Control (CDC) recommends that you stay home for at least 24 hours after your fever is gone, except to get medical care, or for other necessities. Please do not come to class in-person if you exhibit these symptoms instead, and plan to attend remotely if your symptoms are mild. If your symptoms are concerning to you, seek medical attention immediately, and contact the instructor after your checkup--such absences will be excused only once proof of medical attention is provided. Please make sure to inform the instructor at least one hour in advance of when you request to work remotely so that we can set up the class technology appropriately.

Code of Conduct and Class Atmosphere

The members of this class constitute a learning community. Learning in such a community best takes place in an atmosphere in which both instructor and students act professionally. Respecting our peers is also important. Unfortunately, we all have biases, and those biases are not always conscious acts. An interesting study to test your own unconscious biases is available online from Harvard[4]. Being aware of your own biases, and acknowledging they exist, is the first step in ensuring we are all able to learn most effectively in this diverse class. Please note that you are expected to agree to and to abide by the Berea College Computer Science Code of Conduct.

If at any time you have thoughts, comments, or suggestions about how the class atmosphere could be improved or made into one which is more supportive to your learning, please come to our office hours or drop us a note about it. We always welcome such suggestions.

Additional Support

Several opportunities for additional help exist. First, the Computer Science program maintains several Slack channels, where students are welcome to discuss all things CS in an online format, including asking questions related to courses. The primary thing to remember when posting to the Slack channel for this course, **never post solutions to problems**.

Another method to seek additional help is through the Computing and Digital Crafts Lab, located in Danforth Technology 104. The lab is open during the times listed at the top of the syllabus except on evenings of convocations, when the lab may be canceled.

We strongly encourage you to make use of the help available in the course Slack channel, the Computing and Digital Crafts Lab, and the instructor's office hours. Best results are obtained trying to solve problems before asking for help, and students should be prepared to show what they have already tried. No question to which you do not know the answer is "dumb," unless it goes unasked.

Learning Accommodations

Berea College values diversity and inclusion and seeks to create a climate of mutual respect and full participation. Our goal is to create learning environments that are accessible, equitable, and inclusive for all students. If you encounter barriers based on the impact of a disability or health condition, please let Disability & Accessibility Services DAS, 111 Lincoln Hall, 859-985-3237) know immediately so that they can determine if there is a design adjustment that can be made to the course or if accommodations might be needed to overcome the barriers.

Berea College is committed to providing all campus community members with a learning and working environment that is free from discrimination, including sexual misconduct. As faculty members, one of our responsibilities is to help create a safe learning environment on our campus. We also have a mandatory reporting responsibility related to our role as a faculty member. While we will seek to keep information you share private to the greatest extent possible, We are required to share information regarding sexual misconduct with the college. Students may speak to someone

[4] https://implicit.harvard.edu/implicit/takeatest.html

confidentially by contacting Campus Christian Center [859.985.3134] or Counseling Services [859.985.3212] or visit www.berea.edu/titleix/ for more information.

Under Title IX of the Education Amendments of 1972, pregnant and parenting students may be afforded accommodations regarding their educational experience. If you believe that pregnancy or pregnancy-related conditions are likely to impact your participation in this course, please contact Berea's Title VII/IX Coordinator, Joslyn Glover, to discuss appropriate accommodations. She may be reached at Joslyn_Glover@berea.edu or 859.985.3606.

Illness Accommodations

It is possible that a student may contract COVID-19 or another illness during this term and will need to quarantine. Vaccinated people tend to experience only mild symptoms, so we will work with students to make reasonable accommodations to help sick students to attend class remotely and to complete assignments remotely during their quarantine under the following conditions:

- The sick student contacts the instructor via email or Slack preferably by 8 am on each day they wish accommodation, but at a minimum at least one hour before the class session begins.
- The sick student seeks medical attention swiftly and provides documentation that they have sought medical attention.
- The sick student provides regular updates of their status.

Note that I fully reserve the right to decide what is reasonable accommodation and what is not reasonable. If a quarantined student has severe symptoms and/or limited capability to remain engaged with the course, the best option may be for them to withdraw. Please consult with the instructor and your academic advisor immediately should you believe this may be the case for you.

If the College administration decides that some or all courses must run online, please be aware that you must be prepared to have adequate WiFi bandwidth for synchronous class sessions with your video feed on. This class cannot be run effectively without that level of Internet access.