

Instructor Information:

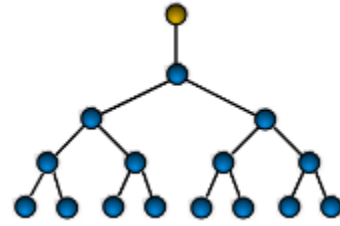
Dr. Jan Pearce

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Office Hours: MWF: 10:30 am - 11:30 am and other times by appointment. Email is a good way to reach me, so please feel free to email me if you have any questions or would like to schedule a time to meet outside of office hours. Please also feel welcome to drop by my office—I like to visit with and to help students!



Primary TAs: Rusty Dotson, Natasha Stallsmith, and Bethanie Williams

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 which 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!

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:

- Appreciate the reasons for breaking a larger task into smaller subtasks and incrementally and methodically designing algorithms and effectively using data structures.
- 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.
- Recognize and be able to explain the impact of design tradeoffs of different data structures and algorithms in applications.
- Develop skill in the C++ language, and be able to explain differences with Python.

2. *Learn to communicate and collaborate effectively:*

Cultivate effective communication with peers as well as thorough code:

- Write readable code which meets design requirements and which both you and others can understand.
- Be able to read, understand, and modify pre-existing code.
- 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:

- Develop skill in locating and utilizing resources.
- Develop faith in their own resourcefulness and learning abilities.

What do employers want?

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 a recent National Association of Colleges and Employers (NACE) Association's Job Outlook survey rated Leadership, the ability to work in a team, communication skills, and problem-solving skills as the top attributes employers seek in an employee (See Figure 1).¹

Figure 1: Attributes Employers Seek on a Candidates Resume

ATTRIBUTE	% OF RESPONDENTS
Problem-solving skills	82.9%
Ability to work in a team	82.9%
Communication skills (written)	80.3%
Leadership	72.6%
Strong work ethic	68.4%
Analytical/quantitative skills	67.5%
Communication skills (verbal)	67.5%
Initiative	67.5%
Detail-oriented	64.1%
Flexibility/adaptability	60.7%
Technical skills	59.8%
Interpersonal skills (relates well to others)	54.7%
Computer skills	48.7%
Organizational ability	48.7%
Strategic planning skills	39.3%
Creativity	29.1%
Friendly/outgoing personality	27.4%
Tactfulness	22.2%
Entrepreneurial skills/risk-taker	19.7%
Fluency in a foreign language	4.3%

Source: *Job Outlook 2018*, National Association of Colleges and Employers

¹ [The National Association of Colleges and Employers \(NACE\), *The Candidate Skills/Qualities Employers Want*](#)

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>.
- The **CSC 236 Data Structures website** by Jan Pearce, <http://cs.berea.edu/courses/csc236/index.html>.
- **Supplemental only: How to Think Like a Computer Scientist** by Scott Heggen, (2018), based on 3rd edition by Peter Wentworth, Jeffrey Elkner, Allen B. Downey, and Chris Meyers, <http://cs.berea.edu/courses/csc226book/>

The Attendance Policy:

Class mini-lectures, discussions, and hands-on laboratory work are considered to be a vital key to success in this course. I hope that class sessions are inclusive, informative, and useful to each student, therefore, attendance is expected at each class session unless a specific exception is made. If you are sick with flu-like 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. Therefore, please do not come to class if you exhibit flu-like symptoms. Instead, e-mail me from your room, and go to health services immediately. When you return to class, bring paperwork showing that you sought medical attention that day and your absence will be excused. 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 is likely to be lowered by one third of a letter grade for each unexcused absence beyond the third. Thus, it is your responsibility to contact me about each absence from class. This should be done via email, 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. Quizzes will be announced and/or occasionally "popped." I will drop the lowest quiz grades before computing your overall quiz score, so under nearly any circumstances, make-up quizzes will not be given.

Technology Policies:

Much of the work in this course will require use of the computer, so these policies are designed to help students better understand how to be effective in a technology-rich environment.

- **Laptop and Software:** Each student must bring his or her appropriately equipped laptop to class every day.
- **Unapproved Technology:** The in-class use of unapproved an unrelated technology will not be tolerated, and in certain cases will constitute a violation of academic honesty. Each and every in-class use of unapproved technology will result in a 1% reduction of the student's assignment or lab grade or a 0 on a specific item such as an exam.
- **Appropriate Collaboration:** Team participation is a proven and useful means by which students can learn material. Much information is easily accessible by searching the web. Students are encouraged to appropriately use information from other students, the web, and other resources. However, any information used from other students or any other resource **MUST BE CITED**. (See below for more information on this serious topic.)
- **Communication:** Electronic communication programs are useful when used appropriately, so each student is required to use the course web page and Moodle course management system to access assignments, and to use a Berea College e-mail account to facilitate electronic communication outside of class.
- **Backups:** All students are expected to back-up their work, which includes assignments, quizzes and exams, daily. The best way to do this is to store a copy of all work in a cloud service such as Box, Dropbox, MS OneDrive, Google Drive, or on a flash drive or some other media, and not in another location on their laptop. The normally understanding instructor will not be at all sympathetic to loss of electronic work, so it is the student's responsibility to protect his/her work from such heartbreaking loss.
- **Exceptions:** Exceptions to any of these technology policies will be considered on an individual case-by-case basis, but will only be granted under extremely unusual circumstances.

Grading Policies:

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. Please address all questions/concerns regarding grading of any component of the course to the instructor only, never to a teaching assistant.

System of Evaluation:

2 Exams (@ 20% each):	40%
Labs:	20%
Quizzes	10%
Assignments:	10%
Teamwork:	10%
Final Project:	5%
Participation & Engagement:	5%

Scale:

A's:	$90\% \leq A- < 93 \leq A \leq 100\%$
B's:	$80\% \leq B- < 83 \leq B < 87 \leq B+ < 90\%$
C's:	$70\% \leq C- < 73 \leq C < 77 \leq C+ < 80\%$
D's:	$60\% \leq D- < 63\% \leq D < 77 \leq D+ < 70\%$
F:	$0\% \leq F < 60\%$

Note that one exam or quiz grade might be dropped as explained below.*

Please refer to the Grading Scale <http://www.berea.edu/cataloghandbook/academics/aps/grades/gradingscale.asp> as described in the current Berea College Catalog for the College-wide interpretations of these letter grades.

* "Good Student" Drop Bonus:

After having completed all work in the course, students who satisfy all of the following conditions will have their lowest exam score or quiz total dropped before their final grade is computed:

- They have completed **all** coursework assignments, projects, quizzes, and exams.
- They have **not** been excessively tardy to or absent from class.
- They have engaged effectively with teamwork and have **not** had any noted incidents of disruptive behavior.

The instructor reserves the right to raise the grades of students who have demonstrated significant improvement in their performance. This is at the sole discretion of the instructor, but a student is welcome to bring such possibility to their attention.

Exams and Quizzes:

Two exams and frequent short reading quizzes will be given in this course. Reading quizzes will be given nearly every class day. Quiz questions will include questions relating to the reading assignment for that lesson. Students will first take these quizzes individually. Those who have taken the quiz individually will be eligible to 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 as well.

The most likely time of the two exams will be:

- Exam 1: Wednesday , October 8, 2019
- Exam 2: Wednesday, November 27, 2019

Problems that appear on the tests will be more varied in nature, ranging from homework or lab-like problems to problems that require a deeper synthesis of ideas. Questions such as true or false questions and short-answer questions may also be included.

On Assignment and Lab Collection:

Homework assignments and labs are a form of written communication that are intended to help students address course learning objectives. Thus, assignments and labs are expected to be well-reasoned and well-organized, in order both to demonstrate reflection, as well as to communicate ideas clearly. Homework assignments and labs are due at the announced time on the announced date due and are to be submitted electronically via Moodle. If Moodle is ever down, they may be emailed to the instructor. They should NEVER be printed or delivered to a student assistant. If a student must miss class due to either a sickness or a planned absence, homework is still expected to be submitted on time. Homework is always posted on the web and may be requested in advance. Late homework will be accepted for reduced credit up until at least the time when the homework assignment is returned to the class.

On Teamwork, Labs, and Assignments:

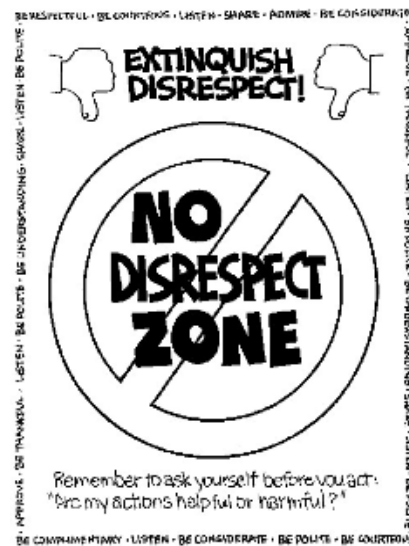
Learning to work in teams effectively is strongly encouraged. All labs will be specifically designed for teamwork. Most homework assignments will be designed for individual work. Teamwork assignments are designed to be co-authored, so each assignment must clearly include all of the authors' names and contributions on all submissions. All assignments and labs should be handed in with the author(s) acknowledging all of the help received for each problem. This includes significant help received from the instructor or TAs or Lab Consultants. Note that the instructor or a Lab Consultant may help with homework or labs, and while this help should not be acknowledged as co-authorship, it should still be mentioned. This is meant to be a sharing process; do not "give credit," to other students who have not attempted to contribute to the work or to the team's work, because it is ultimately not a help for the student who did not contribute to the work. Thoughtful practice, not (even mindful) copying, is ultimately the best way to learn. Note that on all team-completed homework, students must describe the roles played by each author on the co-authored homework submission. *Warning: Please be careful to conform to these standards for teamwork, since they are designed to encourage good learning practices. (Furthermore, copying another person's work or otherwise failing to adhere to these standards may even result in a charge of academic dishonesty.)*

The Scheduled Final Exam Time:

Students are required to present your final project and videos to the class. This is generally a great time. Students who fail attend will receive a one-third letter grade reduction for the course as well as zero credit on the final presentation.

Plagiarism and Academic Honesty:

Plagiarism is the use of anyone else's work or ideas without adequate citation. It is a crime which is both easy to commit and easy to avoid. Ideas taken from other people include those from published or unpublished books, articles, websites, TAs, or friends' homework. The best way to avoid plagiarism is to cite ALL your sources, including those from which you paraphrase or borrow ideas, and to be sure use quotation marks when quoting verbatim. Be sure to be particularly clear what you are borrowing when using internet sources. 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 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. In addition, ALL offenses of plagiarism will be reported to the Associate Provost for Academic Services, as detailed in the *Berea College Student Handbook*.



[From: Life without training wheels blog](#)

The Class Atmosphere:

The members of this class constitute a learning community. Learning in such a community best takes place in an atmosphere in which instructor and students treat everyone with mutual respect. Students need not always raise their hands in order to ask questions or to make comments, but they should not interrupt the instructor or fellow students in doing so. Students typically find the atmosphere set by the instructor to be a sometimes playful and nearly always relaxed one, but students will still need to work hard and consistently both in and out of class in order to do well. 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 of your learning, please come by my office or drop me a note about it. I welcome such suggestions.

Success in Design and Coding:

It is important for you to not be a “Code Monkey”, who is someone who starts writing code without having any design plan first. You will be much more successful if you start early with a solid design and then incrementally develop your implementations. It is common for people to spend 10% of their time writing the code and 90% of the time debugging it without a design plan. It is a very cold and terrible feeling when you are faced with code that is so snarled that you cannot begin to understand how to fix it, and it is due the following day. Second, you **MUST** document your resultant code comments so that someone who is not familiar with your code should be able to understand the design and what you intended to implement. The consequence is if you bring your program with lots of comments to my office hours or to the Lab, we are much more likely to be able to help you and will also be able to give you more useful feedback much more quickly.



Code Monkey from Wikimedia Commons

Additional Support and Disability Accommodation:

The Lab operates in room 104 of the Danforth Technology Building Sunday through Thursday from 6:00 to 9:00 PM (except on evenings of convos). Our primary TAs and most other CS TA's, will be able to answer questions about the computational content in the course during consultations in their Lab hours. Students are strongly encouraged to make use of the help available in the Lab, as well as in 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. Topics in this course build throughout the course, so students should be sure to do their best to keep up, so as to not get behind and forever lost. No question to which you do not know the answer is "dumb," unless it goes unanswered because it remained unasked.

Berea College will provide reasonable accommodations for all students with disabilities to make all learning experiences accessible. If you experience physical or academic barriers based on a documented disability, please see Lisa Ladanyi (Disability & Accessibility Services, 111 Lincoln Hall, 859-985-3327, lisa.ladanyi@berea.edu) to discuss your options. Students must provide their instructor(s) with an official accommodation letter when requesting accommodations. Accommodations will not be implemented retroactively. Please meet with your instructor(s) in a confidential environment to discuss your accommodations.