



# Course Syllabus



## Course Description

The objective of this course is to help students bridge the gap between high-level programming and actual computer systems: processors, the memory hierarchy, operating systems, compilers, linkers, assemblers, networks, and more. Our basic goal is to understand how a computer works, so that as programmers we can make it work efficiently, correctly, and securely. Thus, this course is an introduction to computer systems from a programmer's point of view.

## Prereqs

The official prerequisite for this course is CS 3810 (Computer Organization). It is also recommended that you complete CS 3505 (Software Practice II) before taking this class, unless you are already comfortable with Linux and command-line interfaces, and C or C++.

## Meeting Times/Course Format

M/W 3-4:20PM on Zoom (See the Zoom tab in Canvas). I'll do my best to record and post lecture videos, but there are sometimes technical issues and you can't ask questions to a prerecorded video. Get the most out of lectures by attending them while they're happening.

You will be typically assigned readings/videos to watch before class with a quiz to keep you honest. During class I'll spend some time lecturing to supplement what was in the videos and we'll spend a lot of time solving problems together.

The lab sections for this course will meet weekly. TAs will lead exercises. Lab grades are determined by completing the lab assignments as well as lab attendance. Labs will also be held over Zoom.

## Course Staff

Instructor: Ben Jones (he/him), [benjones@cs.utah.edu](mailto:benjones@cs.utah.edu) MEB 3120 (:fingers\_crossed:)

TAs: TBA



# Course Materials

The required textbook is **Computer Systems: A Programmers Perspective** by Randal E. Bryant and David R. O'Hallaron, 3rd edition, Prentice-Hall, 2016 (ISBN: 0-13-409266-X).

This course follows the textbook more closely than many CS courses you've taken, so you'll get plenty of use out of it!

A highly recommended book is **The C Programming Language** by Brian W. Kernighan and Dennis M. Ritchie, 2nd edition, Prentice-Hall, 1988 (ISBN: 978-0131103627).

Most CS 4400 topics are covered in short videos posted in advance of each lecture. Students should watch such videos before the associated lecture. Each lecture will have a Canvas quiz assigned to ensure that students prepare for each lecture by watching videos and/or reading the textbook. No late quizzes will be accepted.

I'll share other materials (code from class, written notes, etc) on Canvas.


## Student Evaluation

**Assignments.** A significant aspect of the learning experience for this material is attained by hands-on programming to interact directly with the layers of abstraction in computer systems. Consequently, the lab work makes heavy use of C, Unix, and the Intel IA64 (x86) architecture. Students not currently fluent in any of these three topics should not panic, as this course will cover them in more detail throughout the semester. However, **there is an assumption that students have some familiarity with C or C++.** **Students should be prepared to learn some of the C programming language on their own,** for which the Kernighan and Ritchie reference text will be very useful.

To behave properly, **all assignments are configured to run on a CADE Lab 1 machine.**

Dependencies such as the version of compiler, operating system, or shared libraries, you are using can impact correctness of your assignment. Students who choose to develop their code on any other machine must run their assignments on a CADE Lab 1 machine before turning it in. Unless explicitly noted otherwise, grading of assignments will be done using CADE Lab 1 machines. **There will be no credit for programs that do not compile and run on a CADE Lab 1 machine, even if they run somewhere else.**

For more information on the CADE lab and how to remotely log into these machines, see <http://www.cade.utah.edu>.

Programming assignment deadlines are strict, due via Canvas submission by 11:59PM on the posted due date. Late programming assignments are accepted according to the following rules. 

- Assignments are not accepted more than 3 days after the due date.
- Assignments submitted any time  $X$  days after the due date (midnight to 11:59PM) are penalized  $X \times 10\%$  of the assignment grade.

It is the students responsibility to ensure the successful and timely submission of each assignment – start early and follow the instructions carefully. Corrupted or missing files are not grounds for extensions – double-check your submissions and save a digital copy of all of your work in your CADE account.

**Exams.** Two midterm exams will take place online on **Monday Feb 22 and Monday March 29**. The final exam will take place online on **Monday, May 3, 2021 3:30 – 5:30 pm** (scheduled by the University)

**Pre-lecture Canvas quizzes.** To ensure that students prepare adequately before each lecture by watching videos and/or reading the textbook, Canvas quizzes are assigned regularly. You will have three attempts to take the quiz; they are automatically graded and the highest score of three tries will be recorded. Quizzes cannot be taken late. Solutions to the problems will be discussed in class.

**Final course Grade.** For students with an average score on exams (Midterm 1, Midterm 2, Final Exam) of D or lower, the final course grade will be this average.

Otherwise, the total course score is based on the following weights:

- 45% assignments
- 25% midterm exams • 15% final exam
- 10% quizzes
- 5% labs


Letter grades will be assigned using the below scale, and scores will not be rounded.

$90 > X \geq 87$	$B^+$	$80 > X \geq 77$	$C^+$	$70 > X \geq 67$	$D^+$				
$100 \geq X \geq 93$	A	$87 > X \geq 83$	B	$77 > X \geq 73$	C	$67 > X \geq 63$	D	$60 > X \geq 0$	E
$93 > X \geq 90$	$A^-$	$83 > X \geq 80$	$B^-$	$73 > X \geq 70$	$C^-$	$63 > X \geq 60$	$D^-$		

Regrades. Students who wish to appeal a score on an assignment or an exam must do so within one week of receiving the score.

## Getting Help

The TAs and I are here to help you. We are available outside of scheduled class time/office hours by appointment. I will also hold office hours for any help with the material, including help with homework. Help and office hours will be posted online shortly after the start of the semester.

Please use Piazza to contact the course staff. For sensitive or private issues, please contact me directly.  Do not try to contact us via Canvas submission comments on your assignment, we will not see them.

Because of COVID, you'll need to be more deliberate about getting help than usual! The earlier you start assignments, the easier it will be to get help from me/the TAs!

## Working Together

Students are encouraged to discuss assignments and problem sets with fellow classmates, but each student is responsible for writing his/her own answer.

Cheating is: sharing code or other electronic files either by copying, retyping, looking at, or supplying a copy of a file.

Cheating is not: discussing concepts, answering questions about concepts or clarifying ambiguities, helping someone understand how to use the computer systems or basic tools (compiler, debugger, etc.), or helping with high-level design issues or general debugging.

Except when explicitly designated otherwise, each assignment is to be done individually. For all assignments, the solution submitted by each student will be checked against the solutions of other students (from this year's class, as well as previous years) for anomalies. If an anomaly is found that cannot be explained satisfactorily, the students involved will fail the course.

There must be no collaboration during exams. Please see the University of Utah Student Code for a detailed description of the university policy on cheating, also read the Cheating Policy for this class posted on Canvas. Any student found cheating will fail the entire course.

## COE/SOC guidelines

can be found at <https://www.coe.utah.edu/semester-guidelines/> (<https://www.coe.utah.edu/semester-guidelines/>) and <https://www.cs.utah.edu/socguidelines/> (<https://www.cs.utah.edu/socguidelines/>).

## Students with Disabilities

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the [Center for Disability and Access](http://disability.utah.edu). CDA will work with you and the instructor to make arrangements for accommodations.

## Addressing Sexual Misconduct

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

## Student Names & Personal Pronouns

Class rosters are provided to the instructor with the student's legal name as well as "Preferred first name" (if previously entered by you in the Student Profile section of your CIS account). Please advise me of any name or pronoun changes (and update CIS) so I can help create a learning environment in which you, your name, and your pronoun will be respected. If you need assistance getting your preferred name on your UIDcard, please visit the LGBT Resource Center Room 409 in the Olpin Union Building, or email [bpeacock@sa.utah.edu](mailto:bpeacock@sa.utah.edu) to schedule a time to drop by. The LGBT Resource Center hours are M-F 8am-5pm, and 8am-6pm on Tuesdays.

## Student Wellness

Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at [www.wellness.utah.edu](http://www.wellness.utah.edu) or 801-581-7776.

The COE now has its own counseling resources which are described here:


<https://www.coe.utah.edu/students/current/counseling/>

## Veterans Center

If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: <http://veteranscenter.utah.edu/>. Please also let me know if you need any additional support in this class for any reason.

## Learners of English as an Additional/Second Language

If you are an English language learner, please be aware of several resources on campus that will support you with your language and writing development. These resources include: the Writing Center (<http://writingcenter.utah.edu/>); the Writing Program (<http://writing-program.utah.edu/>); the English

Language Institute (<http://continue.utah.edu/eli/>). Please let me know if there is any additional support you would like to discuss for this class. 

## Undocumented Student Support Statement

Immigration is a complex phenomenon with broad impact—those who are directly affected by it, as well as those who are indirectly affected by their relationships with family members, friends, and loved ones. If your immigration status presents obstacles to engaging in specific activities or fulfilling specific course criteria, confidential arrangements may be requested from the Dream Center. Arrangements with the Dream Center will not jeopardize your student status, your financial aid, or any other part of your residence. The Dream Center offers a wide range of resources to support undocumented students (with and without DACA) as well as students from mixed-status families. To learn more, please contact the Dream Center at 801–213–3697 or visit [dream.utah.edu](http://dream.utah.edu).

## Diversity

It is our intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength and benefit. It is our intent to present materials and activities that are respectful of diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally, or for other students or student groups.

## Course Topics

- Number representations
- Control flow and procedures
- Arrays and structs
- Performance optimization
- Memory hierarchy
- Processes
- Signals
- File descriptors, inter-process communication • Virtual memory
- Dynamic memory allocation
- Network programming
- Concurrency and threads
- Linking