

CS 587 Syllabus, Fall 2020

1 Overview

Instructor: Prof. Patrick G. Bridges

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Class Hours: Tuesday/Thursday 12:30pm-2:00pm

Office Hours: Tuesday/Thursday 2:00pm-3:00pm

Meeting Location: Zoom as linked from UNM Learn

Class Paper Discussions: UNM Learn Discussion Forum

General Class/Programming Assignment Q&A: Piazza linked from UNM Learn

CS587, Advanced Operating Systems, is a graduate course on operating systems and distributed systems intended to instruct students in key topics in modern systems software, building on standard undergraduate systems programming, computer organization, and operating systems background. Specifically, the class will focus on building student expertise in several areas:

- Understanding issues faced by operating systems and system software on modern hardware platforms
- Effectively programming modern computer systems
- Reading, understanding, and evaluating modern systems research papers.

Class will be primarily discussion-based, with one or two important research papers or book readings used to guide both in class and online on UNM Learn each week. The lectures will *not*, however, simply summarize the papers—instead, lectures will discuss and debate the important, novel, or controversial approaches taken in the readings evaluate the readings, and describe related work on similar subject. As such, every student is required to read and consider the merits of each assigned prior to class so that they can contribute to the classroom discussion. Class participation *is not optional*—a portion of your grade will be determined by your online participation in UNM learn paper discussion forum.

2 Prerequisites

2.1 Conceptual Background

Students in CS587 are expected to be familiar with basic computer architecture (e.g. basic processor, device, and virtual memory hardware) and with fundamental operating systems techniques, including basic operating system structure (e.g. kernel structure, system calls, interrupts, and polling), process management and scheduling, synchronization and deadlock, virtual memory management, and file systems as taught in any undergraduate operating systems course. CS481 as taught at the University of New Mexico is more than sufficient for these purposes.

The free online book *Operating Systems: Three Easy Pieces* (<http://pages.cs.wisc.edu/~remzi/OSTEP/>) provides good background in the key areas students need to understand. Prior to each course module that requires background material from this book, I will post an online checkup quiz that students

can use to assess their understanding of this material. These checkup quizzes will not be graded, but students will need to understand the relevant material well to participate effectively in the (graded!) online class discussions to which they are related.

2.2 Programming Background

In addition, students should be comfortable with C or C++ programming, the UNIX programming environment (e.g. editors, compilers, linkers, build tools, and debuggers), and basic source code control using Git. The first programming environment in the class will require extensive use of these tools. The Stanford CS Library (<http://cslibrary.stanford.edu>) provides good information for students to refresh their knowledge of many of these topics, including on C (<http://cslibrary.stanford.edu/101>) and UNIX programming tools (<http://cslibrary.stanford.edu/107>). Information on using Git and Github is widely available online (e.g. at <https://lab.github.com/githubtraining/introduction-to-github>).

3 Assignments and Grading

Grades will be determined by student participation in UNM Learn forum discussions, two midterm exams on core operating and distributed systems topics, 3 short (2) page written papers either overviewing an assigned topic or reviews of (a midterm and a final), discussions on short written summaries of the readings, and several programming assignments. Grades are broken down as follows:

- Midterm Exams (2): 30% (15% each)
- Programming Assignments (2): 30% (each divided into 2 parts worth 10% and 5%)
- Written Papers (3): 30% (10% each)
- Discussion Participation (10): 20%

Final grades will be assigned on a 10-point scale (90.0-100 = [A- through A+], 80.0-89.9 = [B- through B+], etc.). I reserve the right to further lower the cutoffs for these grades as necessary, though I will not raise these requirements.

Exams: The goal of the exams is to determine how well students understand the topics already discussed in class. I strive to make exams more conceptual and integrative than purely memorization-oriented, though students are expected to be familiar with the important concepts from the readings and in-class discussions. Note that much of the material from this class will be covered through in-class discussions and is not necessarily in the readings!

Discussion Participation: Instructor-facilitated discussions of the reading assignments are designed to further discussion of topics related in the class. I will post prompt questions on discussion topics in group discussion forums on UNM Learn, and *all* students in the group are expected to (1) Provide their own answers to the prompt questions as followup to that post and (2) respond to other students answers with comments and questions. I will facilitate these discussions in each group, which will be randomly assigned at the start of the second week of the semester. I will also provide a grading rubric for these discussions. *Participation in these discussions are not optional and will constitute 20% of your final course grade!*

Programming Assignments: The programming assignments are designed to give students hands-on experience working with operating systems concepts—system software, and indeed all of computer science, is a practical discipline which in the end is best learned through experience. The first programming assignment will be in the C programming language and the second in the Go programming language. Students are *not* expected to have Go programming experience prior to taking the class, and appropriate introductory material will be provided

Both programming assignments are individual assignments, and are broken down into three steps - setup, phase 1, and phase 2. The setup phase is ungraded and is a milestone that I *suggest* you achieve by the supplied date to ensure you are making adequate progress on the assignment. Phase 1 in each project is

worth two-thirds of the points on the project (10% of the final grade), while phase 2 builds on phase 1 and is worth the remaining one third of the assignment grade (5% of the final grade). Both programming assignments are non-trivial and will take a significant amount of work to complete; do not delay in starting them or in asking for help.

4 Semester Schedule

Below are *tentative, approximate* dates for major course tests and assignments. Note that these dates are subject to change!

Programming Assignment 1: Assigned August 20, Phase 1 due September 10, Phase 2 due September 24

Written Paper 1: Assigned September 22, Due September 29

Midterm 1: October 1

Programming Assignment 2: Assigned October 6, Phase 1 due November 3, Phase 2 due November 16

Written Paper 2: Assigned November 5, Due Nov. 12

Midterm 2: November 18

Final Written Paper: December 10, 10:00am

5 Assignment Submission and Late Assignments

5.1 Assignment Submission

Tests and written papers will be assigned and handed in using UNM Learn. As described above, discussions will be conducted (for a grade) on UNM Learn. Programming assignments will be both assigned and turned in on GitHub Classroom; all students are expected to have a GitHub ID and should create one if they do not already have one.

5.2 Late Assignments

It is important to note that I do *not* accept late assignments. Late assignments will, without prior arrangement or *documented* extraordinary circumstances that make prior arrangement impossible, be given the grade of 0. If you know that you will be unable to make a turn-in date due to illness, death in the family, or other reason, please make arrangements with me either in person, by email, or by phone as soon as possible for an extension. If you miss a turn-in date due to unforeseeable extraordinary circumstances, bring documentation of the situation we will work something out. In general, I will do my best to announce the dates of the exams and the due dates for assignments as soon as possible. If you must miss a midterm, your final exam grade will count for that midterm grade as well.

One final note: requests for regrades of assignments must be made within two weeks from when the assignment is returned. Assignments will not be regraded after that point. In addition, assignments and tests for which a regrade is sought will be regraded *in their entirety*, not just one or two questions about which you may have questions.

6 Academic Honesty

I report all instances of academic dishonesty in writing to the University in writing for appropriate action, potentially up to and including expulsion.

The university policy on academic honesty is contained in the *Pathfinder*; you should review this policy if you are unfamiliar with it. Cheating will result in an automatic F for the entire semester and the case will be turned over to the appropriate authorities for further disciplinary action. *This is your first and only warning!* There will be no second chances. Any work you hand in for this class must be your own original work. Do not under any circumstances share source code or writings with your peers without my explicit prior approval.

That said, I do want students discussing class material actively. As a rule, **all verbal discussions of class materials, including papers and programming assignments are explicitly allowed.** Electronic communication similar in form to verbal communication is likewise allowed. Feel free to describe the general strategy or data structure you used to attack a particular problem in a programming assignment, or what you thought was interesting or flawed about a reading that we will be discussing in class.

The following, however, are clearly not acceptable: copying another person's code; co-developing code with someone else on an individual assignment; mailing your code to another person; using the internet to find a solution to the problem without the instructor's permission; making your files readable so another person can copy them; reading another person's files; using another person's listing (taken from the trash, for example); or having another person write a portion of your code for you. In those cases where you are allowed to use outside materials for an assignment (and such permission must be explicit!), such as code from another program or book, you must document the use of that code both in comments in your program and in the separate README file that will be submitted with all programming assignments.

7 Additional Course Information

7.1 Respect the UNM Community by Preserving Health

You have the ability to prevent the spread of COVID-19 and to preserve the health of fellow students, your instructor, staff and the community by following UNM health protocols. The UNM Provost Administrative Directive on Mandatory Student Face Covering and Symptom Reporting of July 9, 2020 requires that all students on UNM-Main and UNM branch campuses wear face masks in the face-to-face classroom and on campus unless they have a specific mask accommodation (confidentially documented with the Accessibility Resource Center). UNM Provost Administrative Directive is consistent with Governor Lujan Grisham's Public Health Emergency Order as amended, and the Public Health Order of the New Mexico Health Secretary. It also requires daily participation in symptom screening through covidscreen, which will be sent via UNM e-mail.

Acceptable masks and mask wearing in class: A two-layer mask that covers the nose and mouth and that is cleaned regularly is acceptable. A face shield is not sufficient protection. It is vital that you wear your mask correctly, covering your nose and mouth. Removing your mask for an extended period to eat or drink in class violates the Provost Administrative Directive and endangers others.

Mask Wearing Accommodation: Individuals with a documented disability or diagnosis may seek accommodation with the UNM Accessibility Resource Center (ARC) (<https://arc.unm.edu/>). Individuals do not need to reveal private information to an instructor. ARC will require documentation of health requirements, which will be kept confidential. The instructor will be informed only of any need for accommodation.

Consequences of not wearing a mask properly: Unless you have an ARC-approved accommodation, if you don't wear a mask, or if you do not wear a mask properly by covering your nose and mouth, you will

be asked to leave class. If you fail to wear a mask properly on more than one occasion, you can expect to be dropped from the class. If you insist on remaining in the classroom while not wearing a mask (without an ARC-determined accommodation), class will be dismissed for the day to protect others and you will be dropped from the class immediately.

Note that this class is primarily remote-delivered to preserve the health and safety of the students, instructor and community. Please check UNM Learn and Piazza regularly for updates about our class and please check <https://bringbackthepack.unm.edu> regularly for general UNM updates.

7.2 Accommodations

In accordance with University Policy 2310 and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as I am not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow. Contact Accessibility Resource Center at 277-3506 for additional information.

UNM is committed to providing courses that are inclusive and accessible for all participants. As your instructor, it is my objective to facilitate an accessible classroom setting, in which students have full access and opportunity. If you are experiencing physical or academic barriers, or concerns related to mental health, physical health and/or COVID-19, please consult with me after class, via email/phone or during office hours. You are also encouraged to contact Accessibility Resource Center at arcsrvs@unm.edu or by phone 277-3506.

This is a three credit-hour course. Class meets for two 75-minute sessions of direct instruction for fifteen weeks during the Fall 2019 semester. Students are expected to complete a minimum of six hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week.

7.3 Title IX

In an effort to meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered "responsible employees" by the Department of Education (see page 15 of <https://www2.ed.gov/about/offices/list/ocr/docs/qa-201404-title-ix.pdf>) requires that any report of gender discrimination that includes sexual harassment, sexual misconduct and sexual violence made to a faculty member, TA, or GA must be reported to the Title IX Coordinator at the Office of Equal Opportunity (<https://oeo.unm.edu>). For more information on the campus policy regarding sexual misconduct, see: <https://policy.unm.edu/university-policies/2000/2740.html>

7.4 Citizenship and/or Immigration Status

All students are welcome in this class regardless of citizenship, residency, or immigration status. Your professor will respect your privacy if you choose to disclose your status. As for all students in the class, family emergency-related absences are normally excused with reasonable notice to the professor, as noted in the attendance guidelines above. UNM as an institution has made a core commitment to the success of all our students, including members of our undocumented community. The Administration's welcome is found on our website: <http://undocumented.unm.edu/>.

7.5 Support in Receiving Help and in Doing What is Right

I encourage students to be familiar with services and policies that can help them navigate UNM successfully. Many services exist to help you succeed academically and to find your place at UNM, see students.unm.edu or ask me for information about the right resource center or person to contact. UNM has important policies to preserve and protect the academic community, especially policies on student grievances (Faculty Handbook D175 and D176), academic dishonesty (FH D100), and respectful campus (FH CO9). These are in the Student Pathfinder (<https://pathfinder.unm.edu>) and the Faculty Handbook (<https://handbook.unm.edu>).

edu) Please ask for help in understanding and avoiding plagiarism or academic dishonesty, which can both have very serious disciplinary consequences.

7.6 Land Acknowledgement

Founded in 1889, the University of New Mexico sits on the traditional homelands of the Pueblo of Sandia. The original peoples of New Mexico Pueblo, Navajo, and Apache since time immemorial, have deep connections to the land and have made significant contributions to the broader community statewide. We honor the land itself and those who remain stewards of this land throughout the generations and also acknowledge our committed relationship to Indigenous peoples. We gratefully recognize our history.