CMPS 111: Introduction to Operating Systems
Spring 2016

Basic Information

Lectures: MWF 3:30–4:40 AM (Kresge 321)
Labs: Mon 6–8 PM; Wed 6–8 PM; Thu 1–3 PM; Thu 5–7 PM; Fri 8–10 AM
Instructor: Professor Ethan Miller (elm+cs111@ucsc.edu)
  Office: 365 Engineering 2, Wed 2:00–3:00 PM and Fri 10:00–11:00 AM
TAs: Ana McTaggart (amct+cmps111@ucsc.edu)
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  Office: 380 Engineering 2, Hours: TBD
Staff email: cmps111-staff@ucsc.edu
Prerequisites: CMPS 101 and either CMPE 110 or CMPE 112
Home page: https://classes.soe.ucsc.edu/cmps111/Spring16/

Course Overview

The goal for students in this course is to learn the fundamental principles of operating systems. To help students accomplish this goal we’ll cover the various important aspects of operating systems in general, examine specific examples from current operating systems, and do programming assignments on a real operating system (FreeBSD).

The specific topics we will cover include:

- Basic operating system concepts
- Processes and scheduling
- Synchronization and deadlock
- Memory management
- Operating system management of input/output devices
- File systems
- Virtualization
- OS support for multi-core systems
- Protection and security
- Introduction to distributed operating systems (if time permits)

Where possible and appropriate, we will use examples from FreeBSD, Linux, and other modern operating systems to illustrate concepts covered in class.

Prerequisites

The formal prerequisites for this class are CMPS 101 and either CMPE 110 or CMPE 112. Experience has shown that students who took these classes more than two years ago tend to have more difficulty with the material in CMPS 111. Students should also be familiar with C programming in UNIX using such tools as makefiles. Help with these tools is available, but such questions will have lower priority than those about material covered in the course, especially after the first two weeks of the quarter.

Resources

The required text, Modern Operating Systems, 4th Edition, is available at the UCSC bookstore and at online book-sellers such as Amazon. Homework problems may be taken from the book, and lectures and notes will complement the material as presented there. Be sure to get the fourth edition of the text, ISBN 013-359162-X. The optional text covers the internals of the FreeBSD operating system, and may be of interest to those who want to learn more about how the operating system used in assignments actually works, which will be useful for some assignments.
Other than the textbooks, all of the material in this class, including assignments and announcements, will be available online, though some material is available only from the ucsc.edu domain (use the campus VPN, [vpn.ucsc.edu](vpn.ucsc.edu) for off-campus access). Feedback and grades will be available on eCommons. We’ll be conducting all class-related discussion, including announcements, on Piazza, so please sign up at [http://piazza.com/ucsc/spring2016/cms111](http://piazza.com/ucsc/spring2016/cms111).

Assignments, Exams & Grading

Exams

There will be an in-class midterm in the first two weeks of May and a final during the scheduled slot in exam week (Tuesday, June 7th from 12–3 PM). You must take each exam at the scheduled time unless you are ill or have an unexpected family emergency. You must let the professor know by email or text message before the exam’s scheduled start regardless of the reason, and you must provide a doctor’s note or letter from the funeral home before you can make up the exam. There are no exceptions to this policy.

Programming Projects

Programming projects are an important component of this course. Most of the projects will involve modifying an operating system running on a virtual machine on your personal computer. We recommend using VirtualBox, which is available for x86-based systems running MacOS X, Windows, and Linux; you may also use VMware, for which we can provide a free license. In addition, VirtualBox will be installed on the computers in the Ming Ong Computer Lab.

Projects 2–4 must be done in teams of 3–4 students. Project teams will be assigned randomly by the course staff one week before the project is handed out, giving you time to meet the others in your team. Teams for a given assignment cannot be changed unless more than one team member drops the class. Team members receive similar grades for the project, but grades may be adjusted based on student feedback from their team members.

Rather than approve extensions on a case-by-case basis, we’re giving each student 3 “grace days” that may be used, no explanation necessary, to extend the due date of an assignment by 24 hours (this includes weekends and holidays). You may use any number of remaining grace days on an assignment—you don’t have to use them all at once. Once you’re out of grace days, late projects will lose 25 points (out of 100) per day, with a minimum score of 5 points. Projects must be submitted within 72 hours of the original due date, regardless of grace days used. You must turn in a reasonable attempt at each project to pass the class.

For team projects, each team member must spend the requisite number of grace days or lose points accordingly. A project team only gets a single submission date; you can’t turn in one version on time for one person and another version two days late for another person on the same team. All assignments must be submitted before 11:59 PM on Saturday, June 5th, regardless of grace days.

To encourage you to start early and turn your material in early, projects will get a 1 point bonus per (full) 6 hours they’re turned in early, up to a maximum bonus of 12 points. So, if you turn in your project 20 hours before it’s due, you get 3 points added to your grade. The bonus can’t raise your base grade (before extra credit) above 100, and is unavailable if you’re using grace days for the assignment.

Homework

There will be a set of optional, ungraded homework problems assigned about every week and a half. The homework will give you a chance to see how well you understand the concepts we’ve covered in class. You may collaborate with others in the class on homework since it’s ungraded.

Notes & Class Participation

Part of your grade is based on written notes you take on the material we cover in class. These notes may be handwritten or typed by you—you may not turn in material copied verbatim from other sources, including class slides, textbooks, other students, or the Internet). Each week’s notes must be turned into eCommons by Sunday at 9 PM following the week in which the material was covered in class (photos of handwritten notes are fine).
You may receive extra credit on your notes grade for actively participating in class, including things such as actually participating in lecture, visiting office hours, and participating in Piazza discussions. If your exam average is 85% or higher, your notes grade will be the higher of your actual notes grade or your exam average; class participation extra credit is added either way.

Grading

Grades in the class will be assigned as follows:

- Programming assignments: 44%
- Midterm: 15%
- Final: 31%
- Notes & class participation: 10%

The necessary requirements for receiving a C or better are:

- Get at least a 50% weighted average on your exams. A low grade on one exam can be countered by a good grade on the other exam.
- Get at least a 50% average on your programming projects.
- Submit a reasonable attempt of all of the programming projects, even if the assignment is so late that it receives 5 points.

Note that a 50% average on both exams and projects is not sufficient to pass—a 53% on exams and 52% on projects will almost certainly result in a failing grade in the class.

We expect to use the following approximate ranges for overall scores. Individual assignments may be curved, but there is no guarantee of this.

- A: 89–100%
- B: 79–89%
- C: 69–79%
- D: 60–69%
- F: below 60%

Accommodations for Students with Disabilities

If you qualify for classroom accommodations because of a disability, please get an Accommodation Authorization from the Disability Resource Center (DRC) and submit it to the professor in person outside of class (e.g., office hours) within the first two weeks of the quarter. For more information on the requirements and/or process, contact DRC at 459-2089 (voice), 459-4806 (TTY), or at http://drc.ucsc.edu/. We may not be able to accommodate DRC requests made after the first two weeks of class.

Attendance

We won’t usually take attendance at class, except for the first week. However, attendance is mandatory, and you’ll find it difficult to take good notes if you’re not in class. Lab section attendance is not required, though you’ll miss important material on the programming projects if you don’t attend one section per week, since that’s where we’ll discuss projects in detail. You need not attend the section for which you registered, but those registered for a particular section get preference if the room is overfull.
Getting Help

Operating systems is a tough subject, so there are several ways to get help with concepts covered in class, homework, and programming projects, listed in approximately the order you should try them for help.

- Attend classes and lab sections.
- Read the course Web page for information on assignments.
- Read and post to the class discussion forum, hosted at piazza.com.
- Meet with the course staff during office hours.
- Email the course staff (cmps111-staff@ucsc.edu).

You’re encouraged to post general questions to the Piazza forum, and to answer questions others have posted there. Asking things like “how does this concept work?” or “can someone help install FreeBSD on VirtualBox?” are fine. Questions such as “can someone post sample code for Project 2?” or “why doesn’t the attached code work?” are not acceptable, and should be asked during office hours (preferable), or via email. Course staff will also read the forum and reply to posted questions.

Office hours are your chance to ask the course staff in-depth questions about the material being covered, programming assignments (including debugging help), or anything else about operating systems (or other general computer science issues) you want to discuss. Many students find that discussions in office hours are highly informative and interesting, and it usually helps faculty members write you better recommendations for jobs and graduate school. Plus, I’ve got an espresso machine in my office, and am happy to give you a shot of espresso to drink while we’re talking. However, please don’t just drop by outside of office hours, since we may be busy. If you can’t attend office hours, arrange a meeting in advance by emailing the person with whom you want to meet.

Email to the course staff will be answered if possible, especially if it only requires a short answer. Questions like “why doesn’t my code work?” and “please explain this concept to me” can’t be answered via email, so you’ll get a brief “come to office hours” response. It may take up to 24 hours for an email response during the week and longer on the weekends, depending on when the course staff read and respond to email.

Academic Honesty

By taking this class, you agree to abide by the following rules on collaboration. Example situations clarifying these rules are posted at https://classes.soe.ucsc.edu/cmps111/Spring16/academic_honesty.php. You must sign a separate sheet of paper acknowledging that you’ve read and understand these rules. This sheet is available online, and is due by the end of the first week to remain enrolled in the class.

- You may not work on your assignment with anyone.
- You may not show your code or design to anyone.
- You may not have anyone “walk you through” an assignment, describe a solution in detail, or sit with you as you work on it. You may not provide such assistance to anyone, either. This includes friends, family members, tutors, current & former students, paid consultants, and random people on the Internet.
- You may not post code or questions from your project online to ask others for help. This means anywhere online, including Piazza (ask us in person!), independent message boards (e.g., StackExchange) and file sharing sites.
- You may not share your (written) class notes with anyone, even those in your project group.

Of course, these rules don’t apply to other members of your current project group (except for the last one); you’re encouraged to work with them on your assignment—that’s the point of project groups! Note, though, that this only applies to your current project group—people who worked with you on the last assignment or are scheduled to work with you on the next assignment are not in your current project group.

If you’re caught at any time violating these rules (even after the assignment or exam has been returned or the quarter has ended), you will fail the course and the incident will be reported to the School of Engineering and to your Provost.

The bottom line: don’t cheat!

1 Adapted from CSE143 at the University of Washington.