CMPS 111: Introduction to Operating Systems  
Spring 2015

Basic Information

Lectures: MWF 9:30–10:40 AM (Natural Sciences Annex 101)
Labs: Mo 11:00 AM–12:45 PM; Tu 9:00–10:45 AM; We 12:00–1:45 PM; Th 9:00–10:45 AM
Instructor: Professor Ethan Miller (elm+cs111⊙cs.ucsc.edu)
Office: 365 Engineering 2
Hours: Wed 3:00–4:00 PM; Fri 11:00–noon
TA: Shayna Frank (smfrank⊙soe.ucsc.edu)
Office: 480 Engineering 2
Hours: Mon 2:30–3:30; Tue 11:00–noon
Staff email: cmps111-staff⊙cs.ucsc.edu
Prerequisites: CMPS 101 and either CMPE 110 or CMPE 112
Home page: https://classes.soe.ucsc.edu/cmps111/Spring15/

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 discuss 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.

Textbook

The required text, Modern Operating Systems, 4th Edition, is available at the UCSC bookstore and at online booksellers 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.
Online Resources

Most of the material in this class will be available online at https://classes.soe.ucsc.edu/cmps111/Spring15/. Some material is available only from the ucsc.edu domain; for off-campus access, please use the off-campus access proxy or VPN. Feedback and grades will be available on eCommons.

Assignments and announcements will only be available online, so check online for new assignments. We’ll be conducting all class-related discussion, including announcements, on Piazza, so please sign up at http://piazza.com/ucsc/spring2015/cmps111.

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 9th from 4:00–7:00 PM). You must attend each exam at the scheduled time unless you are ill or have a death in the family. 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.

Homework

There will be a set of 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. Homework will be ungraded, but is highly recommended for ensuring that you understand the material.

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 VMWare or VirtualBox, both of which are available for x86-based systems running MacOS X, Windows, and Linux. In addition, VMWare or VirtualBox will be installed on the computers in Social Sciences 1, Room 135. All the tools you’ll need will be readily available for (free) download.

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 a team member drops the class. Team members receive similar grades for the project, but grades may be adjusted based on student feedback on their team members (see assignments for details).

Rather than approve extensions on a case-by-case basis, we’re giving each student 4 “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). Grace days need not all be used on the same assignment—you may use all four on a single assignment, or use one each for four different assignments (or any other combination). For team projects, each team member must spend the requisite number of grace days. For example, if Alice and Bob want a one-day extension for the due date for their project, Alice must use one of her days and Bob must use one of his; it’s not acceptable to use two of Alice’s days. If only one partner uses grace days, the other partners will receive a zero accordingly. A project team may only turn in a project once; you can’t turn in a version on time for one person and two days late for another person on the same team. All assignments must be turned in on or before 11:59 PM on Friday, June 5th (the last day of classes), regardless of grace days. Use your grace days wisely; once you’ve used them up, a project turned in late will receive a grade of zero.

To encourage you to start early and turn your material in early, projects will get a 1% bonus per (full) 8 hours they’re turned in early, up to a maximum bonus of 12%. So, if you turn in your project 18 hours before it’s due, you get 2% 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.

You must turn in a reasonable attempt at each project to pass the class. Graded assignments will be returned as soon as possible, typically within 7–10 days of the due date, and grades will be available online during the quarter.
Class Participation

Your class participation grade is based on several factors: actually participating in lecture, visiting office hours, participating in lab sections, and participating in online discussions. It’s only 3% of your grade, so it won’t determine whether you pass or fail, but it’s how we decide whether to give you an A- or B+ if you’re right on the border.

Grading

Grades in the class will be assigned as follows:

- Programming assignments: 48%
- Midterm: 16%
- Final: 33%
- Class participation: 3%

The necessary requirements for receiving a C- or better are:

- 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.
- At least a 50% average on your programming projects.
- Submission of all of the programming projects. If you miss an assignment due date and have no grace days left, you still have to turn in a reasonable attempt at the assignment, though you’ll receive a zero for it.

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 requests made after the first two weeks of class.

Attendance

We typically won’t take attendance at class, but class participation does count. Assignments and announcements will be posted on the Web, but it’s your responsibility to find out what happened in a class you missed.

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—sections are where the projects will be discussed in detail. You need not attend the section for which you registered, but those who are 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@cs.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 VMWare?” 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 professor or TA 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—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” are much more difficult, to answer via email, so you’ll likely 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. Also, it takes longer to reply to messages that require a more detailed answer.

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/Spring15/academic_honesty.php

You must sign a separate sheet of paper acknowledging that you’ve read and understand these rules; this paper will be handed out at the first class, and a copy will be available online. We won’t accept submission of any of your assignments until you’ve turned in a signed copy of the form.

- 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.

Of course, these rules don’t apply to other members of your current project group; you’re encouraged to work with them on your assignment (that’s the point!). 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!

1Adapted from CSE143 at the University of Washington.