

CSC 565 - Operating Systems

Spring, 2012

Instructor: Michael Black
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(please include "CSC-565" in the subject line of your emails to me)

Times: Mondays and Thursdays, 4:00-5:15
Anderson Computing Center, B13

Office hours: Tentatively:
Mondays & Thursdays, 1-2:30
Wednesdays, 1-4

My office is SCAN 164, and my office phone number is (202) 885-2011.

Textbooks: *Modern Operating Systems, 3rd edition* by Andrew Tanenbaum (*required*)
The C Programming Language by Kernighan and Ritchie (*strongly recommended*)

I also recommend a Linux book if you are unfamiliar with the command line. *Linux in a Nutshell* published by O'Reilly is a decent reference.

Materials:

You will need access to Linux or Unix to complete the projects. If you have a laptop available, I recommend installing Ubuntu Desktop on a partition of your laptop computer and bringing it to class. If you don't want to repartition your hard drive, you can run Ubuntu on a USB stick or on a virtual machine.

Course Description:

This course will cover the basics of computer operating systems. We will be looking at design issues, such as process scheduling, concurrency, memory management, and file systems. We are going to focus primarily on understanding how an operating system works rather than how to use operating systems. However, along the way, you will learn some C programming and gain familiarity with using Unix/Linux.

Prerequisites:

You are expected to have taken CSC280 or the equivalent and know how to program in a structured language. C is very similar to Pascal and Java (without the classes and objects). Previous experience with Linux, computer organization, and assembly language may be helpful along the way, but it is certainly not required or expected.

Course Projects:

In this course, you will build a tiny operating system from the ground up that contains a file system, shell, and process management. Your operating system will run on an actual PC. This project is divided into five steps (Projects A, B, C, D, E) to help pace you through it. A sixth part, Project F, requires you to write an addition of your choosing to the operating system. An overview of the full project is posted on Blackboard (OSProjects.pdf).

You will also write a Linux shell. This is a preliminary project to teach you how to program in C and use Linux.

The shell and OS projects must be submitted on Blackboard by the deadline given in the project. Late projects are accepted up until the final exam, but are subject to a 50% penalty. I may also require you to demonstrate your operating system to me in my office hours to get credit for it.

No credit will be given for any project submission that is not accompanied by a text file explaining: 1) what you did, 2) how to compile and run your project, and 3) how to verify that it works.

You may complete the project individually or in pairs. If you work in pairs, both partners will normally receive the same grade.

Homework:

Between 3 to 6 homework assignments will be assigned, largely from the textbook. These are intended to help you learn the more theoretical concepts and prepare you for the exams. Homework assignments will be due by the beginning of class the week after they are assigned. They should be submitted on Blackboard. Late homework assignments will not normally be accepted.

Exams:

The midterm and final exams will test you on concepts covered in lecture, the readings, the projects, and the homeworks. Unless otherwise specified, the exam will be closed-notes, closed-book. I generally give study guides for exams a week prior to the test.

Because of the quantity of project work, I may choose not to have a midterm exam. If not, the final exam will be comprehensive and count for the midterm portion of the grade.

Late Work:

All work must be submitted by the beginning of class on the date due, unless otherwise specified. Work submitted past the deadline will not be accepted except as explained above. A missed exam cannot be made up. If you have a valid, acceptable reason for missing an exam, the exam will be dropped from your grade calculations.

You will not be graded on your attendance. However, if you miss a class, you are responsible for learning the material that was covered.

Out-of-class Time:

The general rule about out-of-class work is that you should spend two hours outside of class for every hour in class. Since this course meets 2 1/2 hours per week, you are expected to spend 5 hours per week on class work. This is, of course, on average, since some weeks (especially earlier in the course) you will have less work, and some weeks you may find yourself working 7-8 hours or more. I estimate you should spend, on average, 3 hours/week on projects, 1 hour/week on homework, and 1 hour/week on reading and studying for exams (this will be more, of course, if you attempt bonus work). If you find yourself habitually spending more than 8 hours/week outside of class on course work, you should talk to me.

Grading:

The grading policy is as follows:

Homework	10%	
Shell Project	10%	
OS Project (Projects A-F)	40%	(the steps will carry equal weight)
Midterm Exam	20%	
Final Exam	20%	

100-93 A 92-90 A- 89-87 B+ 86-83 B 82-80 B- 79-77 C+ 76-73 C 72-70 C- 69-60 D 59-0 F

I will use two criteria for grading each step of the OS Project:

- 1) Did you complete it?
- 2) Does it work correctly, as specified in the assignment?

I may give additional credit for exceptional creative work. I will not give credit for any step of your project if I am unable to independently verify that your submission works.

Ad-hoc grading policy modifications:

As explained above, if a midterm exam is not given, the final exam will count for 40% of the grade.

I may, at my discretion, choose to drop OS project steps if I find that the overwhelming majority of the class is struggling with it. If a step is dropped you may still complete it for bonus credit.

I may adjust your grade upwards from the breakdown given above, but never downwards. You should expect, however, that you will be graded according to that breakdown.

Academic Integrity:

Plagiarism and academic misconduct are defined in the University's Academic Integrity Code. You should be familiar with what constitutes academic dishonesty. In particular, you should observe the following rules:

- You are permitted to discuss your project work with other students at the conceptual level only.
- Your code must be entirely your own. You are not permitted to share code or use code obtained from the internet in your projects, unless the project specifically states otherwise.
- Collaboration on homework is forbidden. Any information taken from the internet, books, or anywhere else for use on your assignments or projects must be cited.
- Unless otherwise stated, all exams will be closed-book, closed-notes.
- Instances of plagiarism may be reported to the Dean of the College of Arts and Sciences.

Please don't cheat!

Feedback:

I am eager to receive suggestions on how I can improve this course. If you have any comments, please feel free to tell me, either in person, by email, or anonymously in my mailbox.

This will likely be a challenging course, but also hopefully enjoyable and useful. Please let me know throughout the semester if there is something you especially like or dislike.

Approximate Course Outline (subject to modifications)

<u>Week of</u>	<u>Subject</u>	<u>Readings</u>
1/19	What is an operating system?	19-49
1/23	History of operating systems	1-18
1/30	A crash course in C	72-75, 728-736
2/6	System calls and interrupts	49-61
2/13	Anatomy of a program <i>Shell project due</i>	---
2/20	Processes <i>Project A due</i>	83-95
2/27	Threads	95-117
3/5	Critical sections and semaphores <i>Project B due</i>	117-145
3/19	Scheduling <i>Project C due</i>	145-163
3/26	Deadlock <i>A midterm may be given around this time</i>	433-457
4/2	Memory Management <i>Project D due</i>	175-201
4/9	Virtual Memory Issues	201-257
4/16	Files <i>Project E due</i>	255-312
4/23	Devices	329-367
4/30	Peripherals <i>Project F due</i>	390-425