

CMSC 310 (Fall 2013) Operating Systems (3 credits)

<http://marmorstein.org/~robert/Fall2013/cs310.html>

Lecture: 12:00pm - 12:50pm (Ruffner 352)

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Office Hours: 1:00-2:30pm MTWF or by appointment

(I will not have office hours on Thursday this semester)

Course Description:

Emphasis will be placed on concepts rather than case studies and on the interdependence of operating systems and architecture. Topics include instruction sets, I/O and interrupt structure, addressing schemes, microprogramming, memory management and recovery procedures.

Prerequisite: CMSC 162

Course Objectives:

The student will:

1. Make use of semaphores, monitors, and locks to synchronize concurrent processes and threads.
2. Learn algorithms and data structures for scheduling, memory management and file system organization.
3. Understand how the design of an operating system impacts design and performance of user-space applications.

Textbook and Other Resources:

The textbook for this class is "Operating Systems: Internals and Design Principles" by William Stallings (Prentice Hall, 2012) Seventh Edition. However, we will also be making extensive use of "The Little Book of Semaphores", by Allen B. Downey, which is available as a free PDF at <http://www.greenteapress.com/semaphores/>

Most of the homework assignments will be problems from these two books.

Course Requirements:

This class will have both a strong programming and a strong homework component. The projects will comprise 40% of your grade. Homework and quizzes will comprise another 40%. The midterm and final exams will be worth 10% each. The projects in this class are hard -- probably much harder than anything else you've done in the major -- and require a significant investment of time and effort. You will be allowed to work in groups and your grade will reflect both the quality of your group's contribution and your individual contribution within your group.

Grading Policy:

Late work will not be accepted unless you have a serious medical or family condition which prevents you from completing the assignment on time. You do not need a doctor's note, but you must send an **e-mail** to my Longwood account within twelve hours of the assignment due date to make arrangements for the work to be completed.

Slip Days:

Your group will be allocated a fixed number of slip days at the start of the semester which you may use to extend the due date of one or more *programming labs*. You may use all of your group's slip days on as many or as few assignments as you like. Keep in mind, however, that once you use them up, they are gone for good. Slip days are calculated from the minute the assignment is due until you turn it in and are rounded *up* to the nearest integer value. That means that if you turn an

assignment in 24 hours and 1 minute late, you will use up *two* slip days. The slip day clock runs over weekends and holidays, so if a lab is due on Friday and you turn it in on Monday, you will have used three slip days, not just one. Slip days cannot be exchanged, traded, bought, or sold.

Grading Scale:

89:	B+	100-91:	A	90:	A-	
79:	C+	88-81:	B	80:	B	
69:	D+	78-71:	C	70:	C-	
63 or lower:	F	68-64:	D			

(There is no grade of D- in this course.)

Attendance:

I expect you to attend class unless you are sick or engaged in a school-sponsored sport or extracurricular activity. I will rely on your honor for enforcement of the attendance policy. In accordance with Longwood policy, missing more than 10% of scheduled class time (5 class sessions) to unexcused absences may result in loss of one letter grade. Missing 25% of class or more (14 sessions), whether excused or not, may, at my discretion, result in an automatic failing grade.

Food and Drink:

Please do not eat in class (it distracts me and the other students). You may bring water or soft drinks to class. Violations of this policy will be considered an unexcused absence. I occasionally grant exceptions to this rule for students who must otherwise forgo lunch or have medical needs that require them to eat in class. If you feel that you need such an exception, you must make arrangements with me IN ADVANCE (i.e. before bringing food to class).

Cell Phones and Laptops:

Cell phones, music players, and laptops are to be turned off and put away during class, except for use during the lab sessions. Violations of this policy will be considered an unexcused absence.

Group Work:

For the projects you will be required to work in groups of two or three. I will allow you to choose your own groups, but if you do not select a group by the time I hand out the first project, I will assign you to a group. Choose your group carefully, as the projects are cumulative and you will not be able to switch groups between projects.

Collaboration:

Exams and quizzes are to be completed entirely on your own. You may discuss the homework and lab projects subject to these restrictions:

1. You must turn in a copy of your own work which YOU have typed or hand-written.

You may discuss the homework problems in the abstract, but please do not compare answers until after the assignment has been collected. On the projects, you may only turn in code that you (or others in your group) have typed.

2. You may NOT download code from the Internet.

There are several web sites that have solutions to some of the NachOS projects. You may NOT use these sites in any way. However, there are other sites that you may find useful (man pages, articles on operating system concepts, and the Pintos project documentation). You may use these web sites as long as you re-type any code you find (again subject to the three line limit) and do not download or copy/paste anything.

3. You may NOT share code with anyone who is not in your group (except me).

No one outside your group should ever see your code except me. This includes copying files using flash drives, cell phones, e-mail, web sites, floppies, CDs, or any other electronic storage or communication device. It also includes printouts or hand-written copies of your code.

You MAY discuss the general design of the project with students outside your group, but you must limit these discussions to general design details. No one should be looking at your code

who is not in your group. Note that this means that no one who is not in your group should help you with debugging except at a very high (conceptual) level!

You SHOULD share code with the other members of your group. In fact, I strongly encourage you to set up (and use) a git repository.

*Infractions of these policies will be dealt with harshly under the Longwood Honor Code. Any student convicted of an honor offense involving this class will automatically receive a final course grade of **F** in addition to any penalties imposed by the Honor Board. You should consider all work in this class to be pledged work, whether or not the pledge itself appears on the assignment.*

Tentative Course Schedule:

Aug. 26-30	Introduction, Hardware, Interrupts and System Calls Read Stallings Chapter 1 and 2
Sept. 2	Labor Day Holiday: NO CLASS
Sept. 3	Last day of Add/Drop
Sept. 4-6	Processes and Threads Read Stallings Chapters 3 and 4
Sept. 9- 13	Synchronization, Signaling, and Mutual Exclusion, Read Chapters 1 and 2 of the Little Book of Semaphores Project 1 Due
Sept. 16-20	Rendezvouses, Mutex, and Multiplexing Read Chapter 3.1-3.4 of the Little Book of Sempahores
Sept. 23-27	Deadlocks and Races, Barriers, Queues, and FIFO Read Chapters 3.5-3.8 of the Little Book of Semaphores and Read Stallings Chapter 5.1-5.5
Sept. 30- Oct. 4	Catch up, Review and Midterm Exam Project 2 Due
Oct. 4	Pass/Fail Deadline
Oct. 7-11	Producer/Consumer and Readers/Writers Read Chapters 4.1-4.3 of the Little Book of Semaphores Read Stallings Chapter 5.6-5.7
Oct. 14-15	Fall Break: NO CLASS
Oct. 16	Last day to Withdraw without an F
Oct. 16-18	Dining Philosophers, Smokers, and the Barbershop Problem Read Chapters 4.4-5.3 of the Little Book of Semaphores Read Stallings Chapter 6
Oct. 21-25	Memory Management Read Stallings Chapter 7 Project 3 Due
Oct. 28 - Nov. 1	Virtual Memory Read Stallings Chapter 8

Nov. 4-15 Advising and Registration

Nov. 4-8 Scheduling Algorithms, **Project 3 Due**
Read Stallings Chapters 9 and 10

Nov. 11-15 Files and File Systems
Read Stallings Chapter 11

Nov. 18-22 Modern File Systems
Read Stallings Chapter 12

Nov. 25 Catch up Day

Nov. 27-29 Thanksgiving Break: NO CLASS

Dec. 2-6 Catch up and Final Review
Project 4 Due

Dec. 12 **Final Exam** (11:30am-2:00pm, Thursday)