

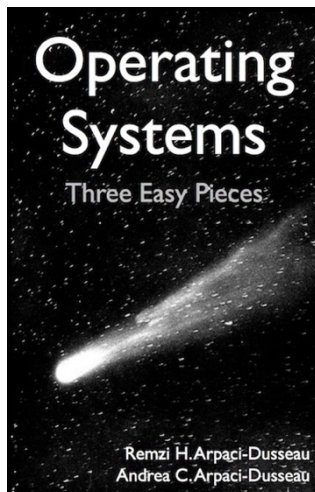
CSCI-340 Operating Systems Spring 2020



Course Information

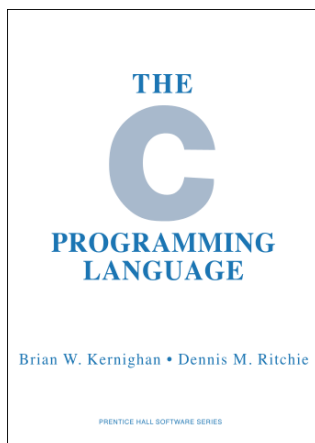
Instructor: Dr. Ralph W. Crosby
Email: crosbyrw@cofc.edu
Slack: cofc-csci340-01-s20.slack.com
Slack will be the preferred method of communication throughout the class. I will always prefer a Slack DM over an email.
Office: HWEA 311
Office Hours: Generally, Tuesday/Thursday 10:00-11:00 although it is best if you set of a time in advance (slack DM, email or arrange in class).

Texts



Required:

Operating Systems – Three Easy Pieces
Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau
<http://pages.cs.wisc.edu/~remzi/OSTEP/>



Optional:

C Programming Language
Brian W. Kernighan and Dennis M. Ritchie
Prentice Hall; 2nd edition (1988)
ISBN-13: 978-0131103627
ISBN-10: 0131103628



Computer Requirements

It might possible to complete this course using the computers available in the department classrooms, library and labs. But, most of you will find it much easier to use your own Mac, Linux or Windows laptop.

Operating systems has traditionally been taught in “C” for number of reasons that we’ll discuss in class. As such, we will be learning some “C” programming as part of this course as well as working examples using “C”. Your assignments may be coded using any programming language, but the language must be able to demonstrate the concepts we’re working with (e.g. concurrency).

Due to its open source nature, Linux generally provides an excellent platform for learning operating systems. Also, since we will be working with relatively low-level code, it is recommended that you build and work in a Linux Virtual Machine (VM). This was you not only will have access to a full Linux implementation but can break it without worrying about doing any significant damage.

Learning Objectives

- Understand the function, basic principles, and desirable characteristics of an operating system
- Understand the historical milestones, advances, and terms in OS evolution.
- Learn and apply the fundamentals of the Unix OS (architecture, file system, editor, basic utilities and shell commands)
- Learn and apply the 'C' programming language for systems development on Unix environments including gcc, make, text editor, and gdb.
- Understand and explain OS architectures including monolithic, layered, virtual machine, client-server, kernel, multiprocessor
- Understand the relationship between an OS and hardware. This includes: processor, memory, disks, I/O devices, distributed systems, and buses.
- Understand the concept of a process (vs thread), as well as key elements of process description and control, and states.
- Understand the principles of concurrency and synchronization mechanisms (e.g., semaphores, monitors, mutexes, message passing, condition variables)
- Understand the principles of deadlocks and prerequisite conditions (e.g., mutual exclusion, hold-and-wait, no preemption, circular wait). This also includes avoidance, prevention, detection, and recovery mechanisms.
- Understand the principles of memory management, including memory partitioning, fitting algorithms, swapping, paging and replacement algorithms, segmentation, virtual memory, working sets, Belady’s anomaly, and thrashing.
- Understand types of uniprocessor scheduling (preemptive and non-preemptive algorithms).
- Understand the basic principles of file management and I/O device management.

Course Outline

Week	Material	Grading
1 – 1/9	<ul style="list-style-type: none">• Introduction to the class• Virtualization• “C” and the Linux Development Environment	
2 – 1/14	<ul style="list-style-type: none">• Processes• “C” and the Linux Development Environment	<ul style="list-style-type: none">• Thursday: Homework 1 Due
3 – 1/21	<ul style="list-style-type: none">• Scheduling• “C” and the Linux Development Environment	<ul style="list-style-type: none">• Thursday: Homework 2 Due
4 – 1/28	<ul style="list-style-type: none">• Memory Management I	<ul style="list-style-type: none">• Tuesday: Project 1 Due• Thursday: Homework 3 Due
5 – 2/4	<ul style="list-style-type: none">• Memory Management II	<ul style="list-style-type: none">• Thursday: Homework 4 Due
6 – 2/11	<ul style="list-style-type: none">• Tuesday: Discussion and Review• Thursday: Test 1	<ul style="list-style-type: none">• Thursday: Test 1
7 - 2/18	<ul style="list-style-type: none">• Concurrency• Command Line Tips and Tricks	<ul style="list-style-type: none">• Tuesday: Project 2 Due• Thursday: Homework 5 Due
8 – 2/25	<ul style="list-style-type: none">• Locks	<ul style="list-style-type: none">• Thursday: Homework 6 Due
9 – 3/3	<ul style="list-style-type: none">• Semaphores	<ul style="list-style-type: none">• Thursday: Homework 7 Due
10 – 3/10	<ul style="list-style-type: none">• Tuesday: Discussion and Review• Thursday: Test 2	<ul style="list-style-type: none">• Thursday: Test 2
11 – 3/24	<ul style="list-style-type: none">• I/O Devices• The Posix API	<ul style="list-style-type: none">• Tuesday: Project 3 Due• Thursday: Homework 8 Due
12 – 3/31	<ul style="list-style-type: none">• Files and Directories	<ul style="list-style-type: none">• Thursday: Homework 9 Due
13 – 4/7	<ul style="list-style-type: none">• File Systems• The Windows API	<ul style="list-style-type: none">• Thursday: Homework 10 Due
14 – 4/14	<ul style="list-style-type: none">• Data Integrity	<ul style="list-style-type: none">• Thursday: Homework 3 Due
15 – 4/21	<ul style="list-style-type: none">• Tuesday: Review for the final• Saturday, April 25th, Noon-3PM, Test 3	<ul style="list-style-type: none">• Saturday: Test 3• Sunday, April 26th: Project 4 Due

Evaluation and Grading

Homework

There will be approximately 10 homework assignments over the semester. The homework will generally not require code to be submitted but may require you to write a small program and discuss its construction or output.

Each homework will count 10 points.

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Projects

There will be 4 projects assigned over the semester. The first project will be focused on learning and becoming comfortable with the C/Linux development environment. The remaining three projects will correspond roughly to the major sections of the class. Projects will be done in groups of two students, if there are an odd number of students, one student only will be allowed to work alone:

Each project will require the students to create some program artifacts as well as descriptions and test code. The preferred approach will be to create a github (or whatever) repository and submit links to your code.

Each project will count 50 points.

Late Work

The goal of the class is to learn operating systems so I'm more interested in your learning the material than meeting some arbitrary deadline. That said, if you get too far behind it's very difficult to catch up (I suspect by this time in your collect careers you fully understand this).

So, I will accept late work (homework or projects) with a penalty as shown below:

- If received no later than 11:59 PM of the following class (generally Tuesday), there will be a 10% deduction.
- If received no later than 11:59 PM of the next program due date (generally the next Thursday) there will be a 20% deduction.
- Thereafter, the program may be submitted any time through 11:59 PM of the day two weeks from the original due date with a 30% deduction.

Submitting Your Work

I don't much like paper. We're programmers and live in the digital world. But there are times when it's just easier to create a quick diagram on paper as part of a homework. So, while I will always create an OAKS dropbox for homework, I will also accept paper submissions as well. Be warned, if I can't read your writing it will adversely impact your grade.

Tests

Three tests will be administered. The third test will be administered during the final exam period. Each test will be focused on the unit

Each test will be worth 100 points.

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Extra Credit

Typically, the total points possible on any test will be greater than 100 although the maximum in Oaks will be 100.

Grading Scale

There will be approximately 600 points available. Grades will be based on the percentage of the points received but I reserve the right to lower the percentages (e.g. start the B's at 75%). I will NOT raise the percentages (e.g. if you have 90% you will always get an A).

A	90%
B	80%
C	70%
D	60%
F	<60%

Tutoring

If you are not familiar with Linux and the "C" language this can be a challenging course. While I am happy to help during office hours, the best option for many students is the use of free tutoring provided by the Computer Science department.

Center for Student Learning

I encourage you to utilize the Center for Student Learning's (CSL) academic support services for assistance in study strategies and course content. They offer tutoring, Supplemental Instruction, study skills appointments, and workshops. Students of all abilities have become more successful using these programs throughout their academic career and the services are available to you at no additional cost. For more information regarding these services please visit the CSL website at <http://csl.cofc.edu> or call (843)953-5635.

Disability Services

The College will make reasonable accommodations for persons with documented disabilities. Students should apply at the Center for Disability Services / SNAP, located on the first floor of the Lightsey



Center, Suite 104. Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me one week before accommodation is needed.

College of Charleston Honor Code and Academic Integrity

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved. Incidents where the instructor determines the student's actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student's file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student's transcript for two years after which the student may petition for the X to be expunged. The F is permanent. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration--working together without permission-- is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others' exams, fabricating data, and giving unauthorized assistance. Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.

Students can find the complete Honor Code and all related processes in the *Student Handbook* at <http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php>

Attendance

Attendance at regular classes is not mandatory. But, much of the work for the class will be done and or assigned in-class and will be difficult to make up later. Attendance for tests is expected (rescheduling for sickness is accommodated). Please do not attend class if you are sick or believe you are becoming ill. It is best to document your absence through an absence report in Undergraduate Academic Services.

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If you miss a significant number of classes, it will be difficult to pass the course. If you have documented absences for the time missed I will be happy to work with you to make up some or all of the material.

If you are unable to be in class for a test, I will be happy to schedule another time for you to make up the assignment ONLY IF you contact me (email preferably) PRIOR to the class.

Use of Electronic Devices

The use of electronic devices, both stand-alone and network capable, will play an increasingly important role in teaching and learning at the College of Charleston, including their use in our classrooms. Just be respectful about unnecessary distractions to yourself and to others seated around you.