Computer Science 320
Operating Systems
11:00 – 12:20 T/Th   Stuart Hall 308

Instructor:	Dr. Stephen Hughes	Office Hours:	315 Stuart Hall
e-mail:	shughes@coe.edu		Mon 10:00 – 11:00, 2:00 – 3:00
			Wed 10:00 – 11:00
phone:	399-8231		By Appointment or Open Door

COURSE DESCRIPTION

This course explores the role of the operating system as an intermediary between the user, software and hardware of a computer system. Includes a system-level view of how the machine resources such as the processor, memory, and storage are managed. Prerequisite: Computer Science II (CS- 135).

LEARNING OUTCOMES

Upon completion of this course, students will be able to:

- Explain the objectives and functions of modern operating systems.
- Describe how finite computer resources are virtualized, allocated and managed.
- Describe the need for concurrency within the framework of an operating system; demonstrate problems arising from concurrent operation and summarize strategies for managing these issues.
- Describe the scheduling algorithms by which resources are allocated to competing entities and the metrics by which these algorithms are evaluated.
- Implement simple scheduling algorithms and identify ways that they are applicable to other domains, such as disk I/O, network scheduling, project scheduling, and problems beyond computing.
- Describe the principles of memory management; explain the concept of virtual memory and how it is realized in hardware and software.
- Describe the choices to be made in designing file systems. Compare and contrast different approaches to file organization, recognizing the strengths and weaknesses of each.
- Explain the basic concepts and mechanisms for adding I/O devices to a computer system.

CLASS ENVIRONMENT

The content of this course spans the spectrum from conceptual to applied.   At the conceptual end, we will look at some of the classic ideas and theories behind operating system design.   You will be required to digest, explain, compare and contrast multiple complex algorithms. On the applied front, students will work to understand how operating system theories are practically implemented using the Linux environment. As we move closer to the bare metal of the machine, you will need to abandon some of the comfortable abstractions provided by higher-level languages and take on more responsibility for coding yourself.

This is a 300-level course and expectations of you are high.   At the conceptual level, your analyses need to reflect a depth of understanding; superficial explanations are insufficient.   It is assumed that you are comfortable reading and writing code and are able to adapt to languages that you have not used. It is likely that you will encounter some coding constructs, libraries or modules that are unfamiliar to you.   To thrive in this course, you must be willing to *independently* research, experiment, fail, recover, explore, tweak, discover and reflect.

This class is expected to consume at least 150 hours of student work over the course of the term.   To meet this expectation, you will need to work outside of our scheduled meeting time.

You should plan to dedicate a *minimum* of 10 hours per week to this class.

COURSE MATERIALS

Textbook:
Operating Systems: Three Easy Pieces R. Arpaci-Dusseau and A.. Arpaci-Dusseau
> This book is available online; links to the relevant chapters will be provided on Moodle.
> You can also purchase a hardcover version for $36 or a softcover for $21.

You will need to have access to a computer that can use the Linux environment.   There are multiple ways to accomplish this:

- Create a Linux partition on your personal laptop.

- Use a Raspberry Pi
  (If you don't have one, the instructor will place an order during the first week of class)

You can also create a bootable Linux environment on a USB drive.   This will work with your own laptop or the PCs in SH 307. Unfortunately, it will not work with the machines in SH308, so you would not be able to use this *during* class time.

STUDENT ASSESSMENT

Your final grade will be determined by the following assessments:

     45% **Unit Exams:** There will be three in-class unit exams.
          These exams will occur on or about: Jan 30, Mar 1 & Apr 3.

     30% **Programming Tasks:** There will be six programming assignments.

      5% **Written Exercises/ Problem Sets**

     20% **Final Exam:** Comprehensive final exam on 4/30 11:00am

Letter grades will be assigned based on the following scale.

	$87 \le$ B+ < 90	$77 \le$ C+ < 80	$67 \le$ D+ < 70	
$93 \le$ A	$83 \le$ B < 87	$73 \le$ C < 77	$63 \le$ D < 67	F < 60
$90 \le$ A- < 93	$80 \le$ B- < 83	$70 \le$ C- < 73	$60 \le$ D- < 63	

Your grades are considered confidential in accordance with FERPA (See page 47 of the Coe College Catalog or online at: http://www.coe.edu/academics/registrar/ferpa).

COURSE POLICIES

Attendance
I do not factor attendance directly into your grade. However, I believe that class attendance is vital to your success in this course; conversations held in class illuminate the class materials and should not be missed.   Material covered during missed sessions is the responsibility of the student. Graded in-class activities, including quizzes, will not be available for make-up without prior approval or extreme circumstances.

Late Work
I value comprehension over deadlines. If you are unable to complete your work by the assigned deadline, come and talk with me about the obstacles that you are experiencing; I will be reasonable.   I reserve the right to assess a 10% late penalty for work submitted after one week and to refuse any submissions made after two weeks.   This course officially ends with the scheduled Final Exam session.   No work for this class will be accepted beyond that point.

Office Hours
Office hours are an opportunity for you to clarify details you may have missed in class, discuss general computer science issues, or to have a profound conversation about the culinary differences between peas and lima beans. *It is time that is reserved for you*; I may appear busy, but you are not interrupting me – unless another student has arrived first. If you come to office hours with a problem on the assignment, you should come prepared to answer questions, as well as ask them. If you have questions regarding code, you also should come prepared with access to an electronic version of your work.

Academic Integrity
Honesty and integrity are qualities we value in ourselves and in others. You are expected to be fully aware of your responsibility to maintain the highest degree of integrity in all of your work.   It is accepted that you have read and understood the standards for academic integrity outlined on page 41 of the Coe College Catalog (online at: http://www.coe.edu/academics/dean/academicintegrity), and will abide by these standards for this course.

I believe that you can learn a lot from your peers, both in the class and in the broader community. Therefore, I *strongly encourage* collaboration with both. However, do not mistake this as a license to cheat.   It is one thing to *learn* from and with your peers; it is another to pass their work off as your own. With respect to writing code for this class:

- You are expected to document any collaboration that takes place.
- Absolutely no electronic transfer of code or written work between students is permitted.
- Any code that you "find" on the Internet must be cited, with an active link to that code.
- While you are encouraged to engage in conversations in online forums, under no circumstances are you permitted to solicit other individuals to complete your work for you.

Ultimately, YOU are responsible for all aspects of your submissions. Failure to be able to explain and defend your submission to my satisfaction will be treated as a violation of academic integrity.

Students with Disabilities
Coe College will make reasonable accommodations for persons with documented disabilities. If you have a disability which may have some impact on your work in this course, please contact the Learning Commons' Student Disability and Academic Services Coordinator.   All arrangements for accommodations must be handled through the Learning Commons; I am not able to offer individual accommodations without documentation from the Student Disability and Academic Services Coordinator.