CS471/571 - Operating Systems

Fall 2020

Syllabus and Information

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General Information

Contact Your Instructor

Name: Steve Baker
Email: Steve.Baker@indstate.edu
Office: Root A-140B
Office: N/A
Instructor Office Hours: 1-1:50pm M-F, online (teams site)

Lecture, Exam

Lecture: MWF 3:00 pm - 3:50 pm in Root Hall A-017
Exams:

- Mid-term: Wednesday Sep 30th
- Final Exam: Wednesday, Dec 9th @ 3pm

GA Tutoring: We have a few graduate assistants who will be in the computer science Unix lab, room A-015 in the basement of Root Hall, for about 20 hours per week in total. You can go to this lab to work on your programs. The computers are Linux machines, and you can use the cs###xx log-in that will be given to you during the first week of class to use them. Or, you can bring your laptop to work on. Either way, you can ask the graduate assistants to look at your programs, and you can work with any other CS students that are there (you could use the lab as a regular meeting place to work with your classmates). The regular hours that the lab will be open will be posted on the department's website.

Prerequisites

Prerequisites: C or better in CS 456 or CS 556; or A- or better in CS 500

Standard text

- The Little Book of Semaphores
- The ext2 File System
- The Unix Timesharing System
- Operating Systems: Three Easy Pieces
- Understanding the Linux Kernel, Bovet and Cesati
- Unix Filesystems, Pate

LockDown Browser + Webcam Requirement

This course requires the use of LockDown Browser and a webcam for online exams. The webcam can be the type that's built into your computer or one that plugs in with a USB cable. Watch this brief video to get a basic understanding of LockDown Browser and the webcam feature. https://www.respondus.com/products/lockdown-browser/student-movie.shtml

Download Instructions

Download and install LockDown Browser from this link: https://download.respondus.com/lockdown/download.php?id=973634934 Once Installed

- Start LockDown Browser
- Log into Blackboard Learn
- Navigate to the test

Note: You won't be able to access tests with a standard web browser. If this is tried, an error message will indicate that the test requires the use of LockDown Browser. Simply start LockDown Browser and navigate back to the exam to continue.

Guidelines

When taking an online test, follow these guidelines:

- Ensure you're in a location where you won't be interrupted
- Turn off all other devices (e.g. tablets, phones, second computers) and place them outside of your reach
- Before starting the test, know how much time is available for it, and also that you've allotted sufficient time to complete it
- Clear your desk or workspace of all external materials not permitted - books, papers, other devices
- Remain at your computer for the duration of the test
- If the computer, Wi-Fi, or location is different than what was used previously with the "Webcam Check" and "System & Network Check" in LockDown Browser, run the checks again prior to the exam
- To produce a good webcam video, do the following:
  - Avoid wearing baseball caps or hats with brims
  - Ensure your computer or device is on a firm surface (a desk or table). Do NOT have the computer on your lap, a bed, or other surface where the device (or you) are likely to move
  - If using a built-in webcam, avoid readjusting the tilt of the screen after the webcam setup is complete
  - Take the exam in a well-lit room, but avoid backlighting (such as sitting with your back to a window)
- Remember that LockDown Browser will prevent you from accessing other websites or applications; you will be unable to exit the test until all questions are completed and submitted

Getting Help

Several resources are available if you encounter problems with LockDown Browser:

- The Windows and Mac versions of LockDown Browser have a "Help Center" button located on the toolbar. Use the "System & Network Check" to troubleshoot issues. If an exam requires you to use a webcam, also run the "Webcam Check" from this

area
- [As applicable, insert information about your institution's help desk, including details about how to contact them. Some help desks want students to run the "System & Network Check" and the "Webcam Check" before they are contacted - and even, to forward the results of these checks at the time of opening a ticket.]
- Respondus has a Knowledge Base available from support.respondus.com. Select the "Knowledge Base" link and then select "Respondus LockDown Browser" as the product. If your problem is with a webcam, select "Respondus Monitor" as your product
- If you're still unable to resolve a technical issue with LockDown Browser, go to support.respondus.com and select "Submit a Ticket". Provide detailed information about your problem and what steps you took to resolve it

Course Announcements

Announcements regarding the course will be made both during class and via email to your @sycamores.indstate.edu email address. You should regularly check this email account or have it forwarded to an account that you check regularly. You can set the account to forward by logging into your indstate.edu email from Internet Explorer (the "light" version of the webmail client that opens up from Firefox or Chrome does not give the option to forward email).

Classroom conduct

You may not use cell phones, iPods/music players, etc. during class. You should be civil and respectful to both the instructor and your classmates, and you should arrive to class a few minutes before the scheduled lecture so you are ready for lecture to begin on time. You may use your computer during class if you are using it to follow along with the examples that are being discussed. You may not check email, Facebook, work on other courses, etc. during class.

Course Description

The catalog description for this course is:

"This class introduces the basic functionality provided by computer operating systems, and covers three main topics. The first topic is memory management; specifically dynamic memory allocation, dynamic address translation, virtual memory, and demand paging. The second topic concerns processor management and concurrency; how do we manage multiple tasks that execute at the same time and share resources. Subtopics in this section include processes and threads, context switching, synchronization, scheduling, and deadlock. The third topic concerns file systems and storage management; the organization and operation of an example file system will be discussed in detail."

Course Outline

- **Weeks 1-7:**
    - Review of systems programming in C/Linux
    - Basic OS concepts:
        - Memory Management
        - Virtual Memory
        - Process scheduling

    - pthreads in C
        - Locking and concurrency

- **Exam #1:** ~ Friday, October 9th
- **Weeks 8-15:**
    - The Xv6 Unix-like teaching OS
    - File-systems

- **Final Exam:**
    - Wednesday, Dec 9th @ 3pm

Normal Content

- Review - System calls everyone should know, basic data structures in C
- Process/Thread Management
    - Single CPU execution - time slicing, scheduling
    - Multi-core execution (pthreads)
    - Shared data - semaphores, other mechanisms, synchronization issues, race conditions

- Memory Management
    - Memory organization, virtual memory, pages, page faults, CPU cache

- Device Management, typically focusing on storage devices and file-systems
    - ext2 file system in detail
    - Other file-systems at a high level

- Other Topics, as time allows

Learning Outcomes

- Most important prerequisite skills/knowledge:
    - C programming experience
    - Some systems level programming in C/Linux

- Most important skills/knowledge gained:
    - Source code for unix system calls - can trace through and explain the code, can make modifications.

    - Unix system calls - can write programs that use the calls to mimic Unix utility commands.

    - Synchronization primitives - can explain proper use and write correct code that

uses primitives to avoid race conditions or logical errors.

- Common scheduling algorithms - can explain common algorithms and tradeoffs.

- Process accounting - can explain in detail at least one process accounting system.

- File systems - can explain in detail the layout of at least one modern file system, can explain basic properties and tradeoffs of a number of others.

- Virtual memory - can explain fundamental concepts and their impact on performance, can explain in detail the mechanism of at least one modern memory management system.

- Modern computer and operating system - can explain the basic architecture of modern computers and operating systems, including how an operating system ensures proper sharing of the following between different programs and users - CPU, disk, memory, other devices.

Grading and Assignments

The students of this course have the following responsibilities: read assigned readings before lecture, attend lecture, complete homework assignments, take in class quizzes, take exams, and possibly complete a project. The final grade consists of:

- **Quizzes: 10% total.** There should be a quiz approximately once per week. For blackboard quizzes you will be allowed to use your notes for the quiz, any other type of quiz, use of notes or Internet or crib sheets will be decided on a case-by-case basis.
- **Homework: 25% total.** There will be a homework assignment most weeks. The total of all homework assignments is worth 25% of the final grade. If you turn in the assignment late, I may grade it at 80%. Homework turned in after I've discussed the assignment WILL NOT BE ACCEPTED. NOTE: you may ask me to look over an assignment before it is due and I may help by pointing out mistakes that need correction and provide other feedback.
- **Exams: 55% total.** We will have two exams. A mid-term worth ~100 points, and a final exam worth ~150 points.
- **Class Attendance/Participation: 10% total.**

Late Homework

All homework assignments will be given a preferred due date. Assignments can be turned in past the preferred due date, but any assignments turned in late will have their value multiplied by 80% (so the highest grade you can get on a late assignment is 80%). Any assignment discussed in depth in class are effectively closed no credit will be given.

Start Homework Early

I suggest attempting a homework assignment the day it is given, or the day after, so that if

you have a problem you can ask early. If you continue to have problems in trying to complete the assignment, you will have time to ask again. Many of the homework assignments require thought and problem solving, which takes "time on the calendar" not just "time on the clock". By that I mean that spending an hour on 3 consecutive days is likely to be more productive than trying to spend 3 hours at once on the assignment.

Expected Amount of Work

My expectation is that an average student will spend about 4 hours OUTSIDE of class each week (that is in addition to class time) WORKING PRODUCTIVELY/ EFFICIENTLY (not just staring at the computer) to complete their coursework for this class. Some students may spend less time than this, and some students will spend more.
Note - your classes should be more important than your part-time job.

Grade Cutoffs

Homework assignments and exams are designed so that a standard cutoff for grades will be close to what you deserve. After the first exam I will create a grade in Blackboard called "Letter Grade" that is what your letter grade would be if the semester ended today. Initially, I will assign the following grades: 93-100 A, 90-93 A-, 87-90 B+, 83-87 B, 80-83 B-, 77-80 C+, 73-77 C, 70-73 C-, 67-70 D+, 63-67 D, 60-63 D-, 0-60 F

My goal is that the different grades have the following rough meaning.
A+/A
You understand everything and probably could teach the course yourself.

B+/A-
You understand nearly everything, and should be all set to use this knowledge in other courses or in a job.

C/C+/B-/B
Some things you understand very well and others you don't (more towards the former for a B and more towards the latter for a C).

D-/D+/C-
You did put some effort in, and understand many things at a high level, but you haven't mastered the details well enough to be able to use this knowledge in the future.

F
Normally, students that get an F simply stopped doing the required work at some point.

Blackboard

The course has a blackboard site. Click https://blackboard.indstate.edu/ to go to blackboard. You should see this course listed under your courses for the current term. The blackboard site is only used for giving you your grades. All course content, schedule, etc. is kept in this web site (which you are currently viewing).

CS Course Policies

Note that this course follows all standard CS course policies. In particular, **(a)** cheating/plagiarism by graduate students results in an F in the course, **(b)** missing 20% of the classes results in an F for any student, and **(c)** there will be no makeup exams. See http://cs.indstate.edu/info/policies.html for details. My attendance policy is further amended such that each unexcused absence beyond 2 will reduce your final grade by 10%.

Academic Integrity

Please follow these guidelines to avoid problems with academic misconduct in this course:

- **Homework:** You may discuss the homework assignments, but should solve and finish them on your own. To make sure you are not violating this, if you discuss with someone, you should DESTROY any work or evidence of the discussion, go your separate ways, SPEND at least an hour doing something completely unrelated to the assignment, and then you should be able to RECREATE the program/solution on your own, then turn that in. If you cannot recreate the solution on your own, then it is not your work, and you should not turn it in.
- **Note on sources:** if you use some other source, the web or whatever, you better cite it! Not doing so is plagiarism.
- **Exams:** This should be clear no cheating during exams. The exams will be closed-book, closed-notes, no computer, and no calculator. You may be allowed one sheet of 8.5" by 11" piece of paper with **hand-written** notes to use as a crib-sheet for your tests.
- **Projects:** You should not copy from the Internet or anywhere else. The project should be your own work. It will be fairly obvious to me if you do copy code from the Internet, and the consequences will be at the least a 0 on the project.

If cheating is observed, you will at the least receive a 0 for the assignment (and may receive an F for the course), and I will file a Notification of Academic Integrity Violation Report with Student Judicial Programs, as required by the university's policy on Academic Integrity. A student who is caught cheating twice (whether in a single course or different courses) is likely to be brought before the All University Court hearing panel, which can impose sanctions up to and including suspension/expulsion. See the http://www.indstate.edu/sjp/docs/code.pdf and http://www.indstate.edu/academicintegrity/ for more information.

Please ask the instructor if you have doubts about what is considered cheating in this course.

COVID-19 Information

Illness: Students who are ill, under quarantine for COVID-19, or suspect they are ill will

report that to Student Affairs. Student Affairs will verify and notify all faculty who have that student. Once notification is made, all faculty will make every reasonable effort to accommodate the student's absence and will communicate that accommodation directly to the student. Students who need to report an illness should contact Office of the Dean of Student at the following website https://cm.maxient.com /reportingform.php?IndianaStateUniv&layout_id=23 . They may also call: **812-237-3829**.

Masks/Shields: Masks/Shields will be worn by all students and faculty in classrooms as well as in buildings (unless you are alone in an office). What is said/printed on a mask will be held to the same Student Code of Conduct standard as if it were printed on a shirt or hat. As a result, a political statement such as MAGA, BIDEN2020, or BLM is not grounds for demanding that it be removed/replaced. In judging what constitutes an offensive statement on a mask, the determination will be made by Student Affairs using the Student Code of Conduct. If there is a question about a mask, the faculty member will refer the matter to Student Affairs and only insist upon its immediate removal if there is no doubt that it violates the Code. Medical waivers will be made through Student Affairs and students with such a waiver are expected to carry the documentation with them and present it when asked.

Laptops/Technology: It is the responsibility of all students to have equipment sufficient to participate in all their classes. All students must have a computer/tablet with audio and video capability. Students will follow the appropriate instructions of their faculty regarding the muting (or unmuting) of audio and video as they would in any classroom setting.

Traffic flow and social distance: Students and faculty will respect the need for social distancing to the degree possible by the setting. Faculty and students will move in and out of the classroom as per the appropriate instructions of the faculty/administration. They are expected to follow printed traffic flow statements posted in all rooms and buildings.

In-class seating: Faculty are asked to assign students seats in the classroom, using social distancing as possible. The assigned seating chart is to be used all semester and kept by faculty as to facilitate contact tracing and help limit any secondary quarantines.

Cleaning of Space: Students are encouraged to clean the surfaces of the chairs/tables /desks they occupy before they sit down and as they prepare to leave. Faculty should advise students to bring cleaning wipes or cloths to clean their own personal space if they want or to be sure to use hand sanitizer on the way in and way out of the classroom.

Refusal: Refusal to comply with any appropriate request will be treated as would any classroom disruption (request to change the behavior; request to leave the class; dismissal of the class and referral to Student Affairs.)

Special Needs / Disability Services

Indiana State University recognizes that students with disabilities may have special needs that must be met to give them equal access to college programs and facilities. If you need course adaptations or accommodations because of a disability, please contact us as soon as possible in a confidential setting either after class or in my office. All conversations regarding your disability will be kept in strict confidence. Indiana State University's Student Support Services (SSS) office coordinates services for students with disabilities: documentation of a disability needs to be on file in that office before any accommodations can be provided. Student Support Services is located on the lower level of Normal Hall in the Center for Student Success and can be contacted at 812-237-2700, or you can visit the ISU website under A-Z, Disability Student Services and submit a Contact Form. Appointments to discuss accommodations with SSS staff members are encouraged.

Once a faculty member is notified by Student Support Services that a student is qualified to receive academic accommodations, a faculty member is obligated to provide or allow a reasonable classroom accommodation under ADA.

Disclosures Regarding Sexual Misconduct

Indiana State University fosters a campus free of sexual misconduct including sexual harassment, sexual violence, intimate partner violence, and stalking and/or any form of sex or gender discrimination. If you disclose a potential violation of the sexual misconduct policy I will need to notify the Title IX Coordinator. Students who have experienced sexual misconduct are encouraged to contact confidential resources listed below. To make a report or the Title IX Coordinator, visit the Equal Opportunity and Title IX website: http://www.indstate.edu/equalopportunitytitleix/titleix.

The ISU Student Counseling Center

HMSU 7 th Floor
812-237-3939
www.indstate.edu/cns

The ISU Victim Advocate

Trista Gibbons, trista.gibbons@indstate.edu
HMSU 7 th Floor
812-237-3939 (office)
812-230-3803 (cell)

Campus Ministries United

Campus Ministries

812-232-0186
http://www2.indstate.edu/sao/campusinistries.htm
www.unitedcampusministries.org
ucmminister2@gmail.com
321 N 7 th St., Terre Haute, IN 47807

For more information on your rights and available resources http://www.indstate.edu
/equalopportunitytitleix/titleix

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