CSCI 3753: Design and Analysis of Operating Systems
Summer 2020

Instructor:	**Christopher Godley**
Email:	Christopher.Godley@colorado.edu
Lecture Recording:	Mon, Tues, Thurs, Fri @ 1:30PM – 2:50PM **(Not a required meeting)**
Lecture Zoom:	https://cuboulder.zoom.us/j/96225352031
Office Hours:	Mon @ 11am – 1pm
	Thurs @ 3pm – 5pm
	Available other times as needed, send me an email to schedule a meeting!
Office Hours Zoom:	https://cuboulder.zoom.us/j/93193510736

Teaching Assistant:	**Shazal Irshad**
Email:	shir8625@colorado.edu
Recitation Time:	Wed @ 9:15am – 10:35am
Recitation Zoom:	https://cuboulder.zoom.us/j/92906611022
Office Hours:	Tues, Fri @ 2pm – 4pm
Office Hours Zoom:	https://cuboulder.zoom.us/j/94761332915

Course Assistant:	**Luke Ingalls**
Email:	luin3949@colorado.edu
Office Hours:	Tu/W 5:15pm – 7:15pm
Office Hours Zoom:	https://cuboulder.zoom.us/j/9517929333

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Prerequisites: CSCI 2400 – Computer Systems

Course Description:

This course introduces students to important Operating Systems concepts. The course will cover key aspects of how an operating systems functions on a modern computer. The following major topics will be covered:

- Basic Operating System Structure
- Devices Management
- Processes and Threads
- Scheduler
- Memory Management
- File Systems
- Networking and Distributed (File) Systems
- Virtual Machines

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Course Website:

Please enroll in the Moodle course web page. Nearly all your class interactions will be available through Moodle.

- Signup Link: TBA
- Enrollment Key: bOSs_2020

Textbook (required reading):

Operating System Concepts, 9th Edition, Abraham Silberschatz, Peter Galvin, Greg Gagne
(electronic or hardcover)

Course Outline (will be adjusted as needed during the semester):

Week	Topics	Due	Reading
1	Machine Components, Virtual Machines (VM), Bus, Controllers, DMA, Device Drivers	PA1	Ch. 1&2 Ch. 13.1-13.4 (9th) Ch. 12.1-12.4 (10th)
2	Device Drivers, LKMs, DMA, Processes, InterProcess Communication	PS1	Ch. 2&3
3	Threads, Thread Safe/Reentrant Code, Synchronization, Mutex/Semaphore/Monitor/CV	PA2	Ch. 4
4	Scheduling Processes and Tasks, Deadlock	PS2/Midterm	Ch. 6&7
5	Memory Management, Virtual Memory, Paging	PA3	Ch. 8, 9
6	Paging, Page Replacement, Memory Allocation, On-Demand Paging	PS3	Ch. 8, 9
7	Disk Scheduling, Storage, File Systems	PA4	
8	Security, Authorization, Symmetric/Public Key Crypto, Networking	PS4/Final	

Grading and Policies:

Each student is responsible for doing the work themselves; no team assignment nor team effort.

This course will assess your knowledge and application using ***program assignments (PA)***, ***written problem sets (PS)***, ***recitation quizzes, midterm exam, and final exam***. The following weights will be used in determining your grade:

10% Quizzes – drop one lowest score

10% Problem Sets (4)

40% Programming Assignments (4)

40% Exams (2 exams, 20% midterm and 20% final)

Submitting Work Late: No late assignments will be accepted.

Assignments will be due on Sunday at 6PM, but to mitigate problems with server or internet access, we will allow submissions of your assignments before 11PM. If you miss the 11PM submission time, your assignment will not be accepted as you are actually six hours late.

In the event of a *documented* personal, family, or medical emergency, consult your instructor about receiving a penalty free extension.

We encourage you to start early on your assignments as the Instructor and CAs are available all week, but will not be available on weekends. You will receive a 10% bonus for completing and submitting assignments by Friday at 6PM. The max grade for every assignment will still be 100%, so Final_score = min(100, score*1.1).

Grading for Programming Assignments:

Grading for programming assignments (PAs) may be based on interview-style grading, where about 20-50% of the grade will be based on the code submitted (does it compile, does it execute the required functions) and about 50-80% of the grade will be based on answering questions from the interviewer in the interview (questions may be based on explaining the code and/or explaining software concepts that the PAs cover), unless otherwise noted.f

> ***Code****:* Programming assignments must be submitted by uploading your code to the Moodle site by their due date, unless otherwise noted. All PAs must be written in C and compiled for execution in the specified environment for that PA, unless otherwise noted. No late submissions will be accepted. If you submit your assignment late, you receive a zero for the code portion of the assignment. ***We highly encourage you to submit running programs that have partially completed functionality for partial credit.***
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> ***Interview****:* Each student must arrange an individual grading interview for each applicable PA. Interview time slots will be posted on the Moodle. You may bring your own laptop to these grading sessions to demonstrate your program to the interviewer and answer questions. Even if your PA code is submitted in time, you must attend your grading meeting to be given a grade for the interview portion of the PA. ***Any missed meetings (without notifying the interviewer ahead of time with a suitable reason) may result in a zero grade for the interview portion of the assignment. The interviewer is under no obligation to reschedule your appointment if you miss your meeting, so write down your meeting times, and don't forget them!***

Grading for Problem Sets:

All problem sets must be submitted by the deadline. *No late submissions are allowed.*

Grading for Recitation Activities:

All recitation activities or quizzes must be submitted during recitation. *No late submissions or makeup times are allowed.*

Other Assignment Information

Written work must be neat and readable, with adequate spacing and margins. Your name, the date, and your section number must be at the top right of the first page. Code files should have your name, date, and homework number included as comments at the top of the file. All programs must have the algorithm for the solution(s) within a comment at the top of the code file.

Attendance

Attendance at all class lectures and recitations is highly recommended. You are responsible for knowing the material presented during lecture and recitation, even if you were not in attendance when the material was presented. ***Attendance is required at recitations to receive credit for recitation activities.***

Classroom Behavior

Students and faculty each have responsibility for maintaining an appropriate learning environment. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender

pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior and the Student Code of Conduct.

It is expected that each of you will be respectful to your fellow classmates and instructors at all times. In order to create a professional atmosphere within the classroom, you are expected to:

- Arrive to class on time.
- Turn off your cell phone (talk and text).
- Bring your laptop to class if you have one to participate in classroom activities. Please restrict laptop use to these activities only, no email, Facebook, Youtube, etc.
- Put away newspapers and magazines.
- Refrain from having disruptive conversations during class.
- Remain for the whole class; if you must leave early, do so without disrupting others.
- Display professional courtesy and respect in all interactions related to this class.

Compliance with these expectations will assist all of us in creating a learning community and a high quality educational experience.

Though many of the above stated policies address academic climate within the classroom, these policies should also be upheld outside of the classroom. As a member of the CU community you are expected to consistently demonstrate integrity and honor through your everyday actions. Faculty, TAs, and staff members are very willing to assist with your academic and personal needs. However, multiple professional obligations make it necessary for us to schedule our availability. Suggestions specific to interactions with faculty and staff include:

- Respect posted office hours. Plan your weekly schedule to align with scheduled office hours.
- Avoid disrupting ongoing meetings within faculty and staff offices. Please wait until the meeting concludes before seeking assistance.

Email Policy

All communications about the course should be through the Moodle Discussion Forums. If you need to send a private message to the instructor or CA, use email instead of private message function on Moodle.

Respect faculty and staff policies regarding use of email and note that staff and faculty are not expected to respond to email outside of business hours. Send email messages to faculty and staff using a professional format.

Emails in reference to this course must follow the following tips for a professional email or they will be ignored:

- Always fill in the subject line with a topic that indicates the reason for your email to your reader. Use **[CSCI-3753]** in your email subject for this course. When you email TA, copy the Instructor for grade-related inquiries.
- Respectfully address the individual to whom you are sending the email (e.g., Dear Professor Smith).
- Avoid email or text message abbreviations.
- Be brief and polite.
- Add a signature block with appropriate contact information.
- Reply to email messages with the previously sent message. This will allow your reader to quickly recall the questions and previous conversation.

CSCI Collaboration Policy

The Computer Science Department at the University of Colorado at Boulder encourages collaboration among students. To support students in collaboration the Department has created a Collaboration Policy that makes explicit when their collaborative behavior is within the bounds of collaboration and when it is actually academic dishonesty, and therefore a violation of the University of Colorado Boulder's Honor Code.

Students are most successful when they are working with other students to understand new concepts. The ultimate goal is that you fully understand the code you develop and be able to collaborate with others in a mutually beneficial way.

Unless otherwise specified, you may make use of outside resources (internet, other books, people), but then you must give credit by citing your sources in the comments inside your code. Use of outside resources does not include downloading complete, or almost complete, solutions to an assignment, whether you cite the source of the solution or not. This is considered plagiarism and violates the University's Honor Code policy.

Examples of citing sources include:

> // Modified version from https://github.com/Phhere/MOSS-PHP
>
> // Adapted from Program #7.2 in book "Accelerated C++" by Stroustrup
>
> // Worked with Joe Smith from class to come up with algorithm for sorting // Received suggestions from stackExchange website (see http://....)

A good rule of thumb: "If it did not come from your brain, then you need to attribute where you got it."

Collaboration Exceptions

Certain homework, quizzes, or exams may be required to be completed without outside resources (see course overview for details). In these cases, it is your responsibility to know the extent of approved resources and use only those that have been specifically allowed. Use of outside resources in these cases would violate the collaboration policy.

Examples of violating the Collaboration Policy (resulting in a 0 score for assignment)

- Copy and Paste is unacceptable. You should understand the concepts and be able to implement the algorithms without using a copy of the original.
- Sharing a file with someone else.
- Submitting a file that someone else shared with you.
- Stealing a copy of someone else's work and submitting as your own (even with modification).
- Copying or using outside resources to solve a component of a larger problem and not citing your sources.
- Copying or using an entire solution that you didn't generate, regardless of whether you cite your sources. This includes using source from online sources or previous semesters.

Examples of collaborating correctly:

- Asking another student for a helpful suggestion.
- Reviewing another student's code for issues/bugs/errors.
- Working together on the whiteboard (or paper) to figure out how to approach and solve the problem. In this case you must include that person's name in your collaboration list at the top of your submission.

This collaboration policy requires that you be able to create the code (or solve the problem) on your own before you submit your assignment.

Any discovered incidents of violation of this collaboration policy will be treated as violations of the University's Academic Integrity Policy and will lead to an automatic academic sanction in the course and a report to both the College of Engineering and Applied Science and the Honor Code Council. Students who are found to be in violation of the Academic Integrity Policy can be subject to non-academic sanctions as well, including but not limited to university probation, suspension, or expulsion.

Collaboration boundaries are hard to define crisply, and may differ from class to class. If you are in any doubt about where they are for a particular course, it is your responsibility to ask the course instructor.

Accommodation for Disabilities

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website (www.colorado.edu/disabilityservices/students). Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see Temporary Medical Conditions under the Students tab on the Disability Services website and discuss your needs with your professor.

Religious Holidays

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, contact your instructor at the beginning of the semester to arrange alternatives for assignments and exams. See the campus policy regarding religious observances for full details.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the OIEC website.

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the academic integrity policy. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at the Honor Code Office website.