CSCI 3753: Design and Analysis of Operating Systems - Fall 2021

Instructor: CJ Herman
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Office Hours: See Canvas for current office hours
Class Time / Location: TuTh 12:45 – 2:00pm / ECCR 265

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

System Calls, Device Drivers and DMA
Processes and Threads
Interprocess Communication
Virtual Machines
Scheduling and Synchronization
Virtual Memory and Paging
Disk Hardware and Filesystems
Networking

In addition, the class will gain familiarity with important software tools such as debuggers, compilers, editors, kernel modules, and virtual machines.

Textbook:
Operating System Concepts, 9th or 10th Edition, Abraham Silberschatz, Peter Galvin, Greg Gagne

Course Website:
All of your class interactions will be available through Canvas.

Grade Breakdown:

10%	Problem Sets and Quizzes
50%	Programming Assignments
40%	Exams (2)

Assignment of letter grades is made by the instructor at the end of the course based on your cumulative weighted percentage. The scale upon which this final assignment is made is A >= 90%, B >= 80%, C >= 70%, and D >= 60%. The instructor reserves the right to alter this scale as needed. The instructor also has discretion to apply +'s and -'s and to modify letter grades for reasons other than course scores, e.g. violations of the honor code, class attendance, student participation and other behaviors.

Submission Deadlines:
Late work is not accepted without a documented personal, family, or medical emergency. Assignments will generally be due on or before 11:59PM on the due date. If you miss the 11:59PM submission time, your assignment will not be accepted.

Grading for Programming Assignments:
Approximately 50% of the Programming Assignment (PA) grade will be based on the code submitted (ie. does it compile, does it execute the required functions) and about 50% of the grade will be based on answering questions from the TA during an interview (questions may be based on explaining the code and/or explaining software concepts that the PA covers).

Code:
Programming Assignments must be submitted by uploading your code to Canvas by the due date. All code must be written in C and compiled for execution in the specified environment. No late submissions will be accepted. If you submit your assignment late, you will receive a zero for the code portion of the assignment. You are highly encouraged to submit running programs that have partially completed functionality for partial credit.

Interview:
Each student must arrange an individual grading interview with a TA for each Programming Assignment. Interview time slots will be posted on Canvas. You must bring your laptop to these grading sessions to demonstrate your program to the TA and answer questions. Any missed meetings (without notifying your TA ahead of time with a suitable reason) may result in a zero grade for the interview portion of the assignment. The TAs are under no obligation to reschedule your appointment if you miss your meeting.

Classroom Behavior:
Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. 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. For more information, see the policies on classroom behavior and the Student Conduct & Conflict Resolution policies.

Requirements for COVID-19:
As a matter of public health and safety due to the pandemic, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. Students who fail to adhere to these requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct and Conflict Resolution. For more information, see the policy on classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the "Accommodation for Disabilities" statement on this syllabus.

As of Aug. 13, 2021, CU Boulder has returned to requiring masks in classrooms and laboratories regardless of vaccination status. This requirement is a temporary precaution during the delta surge to supplement CU Boulder's COVID-19 vaccine requirement. Exemptions include individuals who cannot medically tolerate a face covering, as well as those who are hearing-impaired or otherwise disabled or who are communicating with someone who is hearing-impaired or otherwise disabled and where the ability to see the mouth is essential to communication. If you qualify for a mask-related accommodation, please follow the steps in the "Accommodation for Disabilities" statement on this syllabus. In addition, vaccinated instructional faculty who are engaged in an indoor instructional activity and are separated by at least 6 feet from the nearest person are exempt from wearing masks if they so choose.

Students who have tested positive for COVID-19, have symptoms of COVID-19, or have had close contact with someone who has tested positive for or had symptoms of COVID-19 must stay home. You may work remotely for the duration of your quarantine.

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. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition, see Temporary Medical Conditions on the Disability Services website.

Preferred Student Names and Pronouns:
CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Honor Code:
All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code academic integrity policy. Violations of the Honor Code may include, but are not limited to: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found on the Honor Code website.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation:
The University of Colorado Boulder (CU Boulder) is committed to fostering an inclusive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by or against members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or email cureport@colorado.edu. Information about OIEC, university policies, reporting options, and the campus resources can be found on the OIEC website.

Please know that faculty and graduate instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about their rights, support resources, and reporting options.

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. See the campus policy regarding religious observances for full details.

Tentative Schedule:

Week	Topic	Reading	
		9th Edition	10th Edition
1	Machine Components, Boot Loader, Kernel Mode, System Calls	Ch. 1, 2	Ch. 1, 2
2	Bus, Controllers, Direct Memory Access (DMA), Device Drivers, LKMs	Ch. 11.1, 13.1-13.3	Ch. 12.1-12.3, 13.1
3	Processes, Interprocess Communication (IPC)	Ch. 3	Ch. 3
4	Threads, Thread Safety and Reentrant Code	Ch. 4	Ch. 4
5	Synchronization	Ch. 5	Ch. 6, 7
6	Mutual Exclusion, Semaphores, Monitors & Condition Variables	Ch. 5	Ch. 6, 7
7	Deadlock - Conditions, Detection, Avoidance	Ch. 7	Ch. 8
8	Exam 1	Review	
9	Scheduling Processes and Tasks, Performance Criteria	Ch. 6	Ch. 5
10	Memory Management	Ch. 8, 9	Ch. 9, 10
11	Virtual Memory	Ch. 8, 9	Ch. 9, 10
12	Disk hardware, Disk R/W scheduling, Flash drives, RAID File Systems	Ch. 10	Ch. 11
13	File Allocation, Free Space Management, File Systems	Ch. 11, 12	Ch. 13, 14
-	Fall Break	No Reading	
14	Networking	Ch. 17	Ch. 19
15	Virtual Machines	Ch. 16	Ch. 18
Finals Week	Exam 2	Review	