



Course Details

Course Overview:

Course Code: (1) OPERATING SYSTEMS - CSCI 442 A
(2) SP TPS: OPERATING SYSTEMS - CSCI 598G A

Semester Year: 01/12/2025 - 05/15/2025

Credit Hours: 3

Class Meeting Times and locations:

- (All Sections) Tu/Th: 02:00 PM - 03:15 PM, Coolbaugh Hall | Room 209

Instructor (All Sections): Drs. Dong Chen, Associate Professor, Computer Science Department.

- **Email:** dongchen@mines.edu
- **Office Phone:** 303-384-2765
- **Office Location:** CTLM, 214D
- **Instructor Website:** <https://people.mines.edu/dongchen/>

Teaching Assistants (TAs):

- * Caden Swartz, caden_swartz@mines.edu, (Project Support, Grade Inquires, Gradescope/Autograder Maintenance)
- Lindsey Shanahan, lindsey_shanahan@mines.edu, (Project Support)
- Mallory Shaloy, mallory_shaloy@mines.edu, (Project Support)
- Pratik Asarpota, pratik_asarpota@mines.edu, (Project Support)
- Rygar Schyberg, rygar_schyberg@mines.edu, (Project Support)
- John Rodocker, john_rodocker@mines.edu, (Project Support)

* More detailed Instructor and TA office hours can be found on course Canvas front page.

Pre-requisites:

CSCI-220 (Data Structures), CSCI-341 (Computer Organization), CSCI-262 (Intro. to the Linux)

Required Technology:

- **Laptop, desktop, or notebook with keyboards, or another personal computer.** You will need it for programming projects and midterm and final exams. Note that, CS department and Mines Library may have some limited loaner laptops available. Please inquiry to them directly.
- **Canvas.** You will finish your homework and two exams using quiz modules on Canvas. You will also use **Ed Discussion** to discuss questions about projects and exams. You may also need to use calculator on Canvas, if necessary, in your exams.



- **Docker.** You will work in a customized docker image environment supported by our teaching team for your programming projects.
- **Git Commands.** You will use GitHub repositories to receive starter codes and work on your programming projects.

Welcome to CSCI 442 OS:

This course introduces the essential concepts in the design and implementation of operating systems: what they can do, what they contain, and how they are implemented. Despite rapid OS growth and development, the fundamental concepts learned in this course will endure. We will cover the following high-level OS topics: Computer/OS Overview, Processes, Processor Scheduling, Memory Management, Virtual Memory, Threads, Process/Threads Synchronization.

Course Description:

(I, II) Introduces the essential concepts in the design and implementation of operating systems: what they can do, what they contain, and how they are implemented. Despite rapid OS growth and development, the fundamental concepts learned in this course will endure. We will cover the following high-level OS topics, roughly in this order: computer systems, processes, processor scheduling, memory management, virtual memory, threads, and process/thread synchronization. This course provides insight into the internal structure of operating systems; emphasis is on concepts and techniques that are valid for all computers. Prerequisite: CSCI220 with a grade of C- or higher or CSCI262 with a grade of C- or higher, CSCI274, CSCI341.

Learning Outcomes:

At the completion of the course, you will be able to:

- (LO1) Learn the essential concepts in the design and implementation of operating systems: what they can do, what they contain, and how they are implemented.
- (LO2) Sharpen C/C++ programming and object-oriented development skills and, practice on simulation software design and implementation, and get familiar with using Linux system calls.
- (LO3) Understand fundamental resource management and scheduling techniques that will help you establish the necessary base-knowledge required in many CS-related fields of industry and research: performance optimization, security considerations, resource sharing etc.

The assessments for this course include the following:

- **Programming projects (40%).** Following projects are planned for this semester.
 - [LO1] [~5%] [C] Project 1: Warm-up (A gentle introduction to the environment.)
 - [LO1,2] [~9%] [C] Project 2: Shell implementation (Build your own professional command-line tool.)
 - [LO2,3] [~9%] [C] Project 3: Parallel programming: pzip
 - [LO2,3] [~8%] [C/C++] Project 4: CPU scheduling simulator
 - [LO2,3] [~9%] [C/C++] Project 5: Memory access simulator



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- f. For projects, you will be penalized **5%** of your final score for each late day you submit. Late submissions are “**rounded up**”. E.g. 1 hour = 5% penalty, 25 hours = 10% penalty. Cap for the total lost: **50%**.
- g. Some projects may be dropped, modified or grading weights can be changed as the semester evolves. Please see Canvas for the most up-to-date information.
- **Homework assignments** (5%, using Quiz module on Canvas).
 - a. There will be a total of 7 homework assignments on Canvas.
 - b. The homework with the lowest grade will be **eliminated**.
 - c. For homework, you will be penalized **5%** of your final score for each late day you submit. Late submissions are “**rounded up**”. E.g. 1 hour = 5% penalty, 25 hours = 10% penalty. Cap for the total lost: **50%**.
 - d. Some homework assignments may be adjusted or dropped as the semester evolves. Please see Canvas for the most up-to-date information.
- The **strict** deadline for submitting any late homework or projects is May 2, 2025, at 11:59:59 pm in Denver time. NO late submissions will be accepted beyond this time. Following the final exam, the entire team will be engaged in grading the final exam, reviewing all homework and project grades. Your letter grade will be made available on Canvas within **3 business days** after your final.
- **Exams** (55%, using Quiz module on your Canvas).
 - a. **Midterm** (25%, total: 90 minutes, Common Exam, Format, Date and location: TBA). Open to 1-page double sided A4/us letter size paper note.
 - b. **Final** (30%, total: 90 minutes. Format, Date and location: TBA). Open to 1-page double sided A4/us letter size paper note.
 - c. Please fully charge your laptops and bring them to the exams. Scratch/blank paper will also be provided by our teaching team.
- To ensure clarity and uniform understanding of your progress (in particular, N/A confusing meanings on Canvas) for both you and our teaching team, we will **initially set the scores for homework/project/ to default at 0**.
- The deadlines are established according to the course schedule and Mines school policies and are **not** subject to personal negotiation.

Recommended Textbooks (Any one of the books should work out):

1. Title: “[Operating Systems: Internals and Design Principles](#)”, 9th Edition, by William Stallings, Prentice Hall (ISBN-13: 978-0134670959). Textbook website: <http://WilliamStallings.com/OperatingSystems>
2. Title: “[Operating System Concepts](#)”, EAN/ISBN/SKU: 9780470128725, Author: SILBERSCHATZ, Publisher: WILEY, Edition: 8TH 09. Textbook website: <https://codex.cs.yale.edu/avi/os-book/OS2/index.html> or <https://os-book.com/>
3. Title: “[Operating Systems: Three Easy Pieces](#)”, by Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau. Textbook website: <https://pages.cs.wisc.edu/~remzi/OSTEP/>.

* Our lecture slides will provide the most information on the topics. **Textbook #3 is free.**



Policies and Campus Resources

Absences:

Mines students are expected to fulfill their academic requirements through attendance and/or participation. Class attendance is required of all students unless the student has an excused absence granted by the school or the student's professor. An excused absence awarded by the school or professor comes after a student's request or initiative. To review the Excused Absence Policy and/or to request an excused absence, please visit <https://www.mines.edu/student-life/student-absences/>.

- You are all encouraged to actively participate in project and assignment discussions on Ed Discussion and provide feedback to your peers.
- Answering other students' questions on Ed Discussion will be weighted heavier when calculating extra participation credits.
- We will take random attendance and sometimes pop-quizzes, which will count towards extra participation credits.

Grading Policy:

- Grades will be assigned on the following basis:

Homework	Midterm	Final	Project	Participation
5 %	25 %	30 %	40 %	Up to 3 % (extra)

- **Participation credits** will be determined based on Ed Discussion participation, attendance, and in-class quizzes. Active participation in Ed Discussion (i.e., asking and/or answering questions) is necessary to get full extra credits.
- **Letter grades** will be determined as follows:

A: 94 – 100	A-: 90 – 93.99	B+: 86 – 89.99	B: 83 – 85.99	B-: 80 – 82.99	C+: 76 – 79.99
C: 73 – 75.99	C-: 70 – 72.99	D+: 67 – 69.99	D: 63 – 65.99	D-: 60 – 62.99	F: 0 – 59.99

- **Depending on how students score there may be some plus/minus or downward adjustment, but students should not count on that.**
- Extra credit may be offered for additional programming project learning activities related to this class. Unless otherwise detailed in this syllabus, the awarding of extra credit is at the discretion of the instructor and is not guaranteed.
- The grades of homework and programming projects are considered permanently finalized on the 7th day after their postings (including the posting day).
- All students will be able to see their finalized letter grade on Canvas Gradebook after final exam is graded.

Late Submission Policy:



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- Projects and homework that are not submitted by the deadline will be penalized by 5% for each day you submit late. If you are an hour late, it counts as a day.
 - For projects, you will be penalized **5%** of your final score for each late day you submit. Late submissions are “**rounded up**”. E.g. 1 hour = 5% penalty, 25 hours = 10% penalty.
Cap for the total lost: 50%.
- The only exception will be if you submit an “**excused absence**” via “Request an Excused Absence (4 options)” <https://www.mines.edu/student-life/student-absences/>. This may include: (1) Unexpected illness lasting 3 days or less, (2) Authorized Activity Absences, (3) Personal Reason Absences, and (4) Varsity Athletics Absences. We need to be officially notified by the school for your excused absence. Please don’t send us your doctor’s notice or test results.
- You will be given extra days that are **equal** to the intersection of your excused absence and the duration of the project or homework (i.e., the time between the hw/project posted and its deadline).
- **We will NOT honor extra time requests for projects or homework if you don’t have an official excused absence.**

Communications:

- All announcements, homework/project postings, corrections/changes to assignments, deadlines, schedules and other communication will be done via **Canvas** and **Ed Discussions**.
 - **You are responsible for reading ALL Canvas announcements.** In the past, students missed points because they did not read the announcements.
 - **Ed Discussions will not have critical announcements;** however, you can find your answers to your project and other questions on Ed Discussions.
 - If a TA needs to cancel their office hours, they will communicate via Ed Discussions.
 - Please DO NOT send messages over Canvas. We don’t check such messages. Use email if you need to directly communicate with instructors or TAs.
- **Due to the size of the class and the load of the course, please follow this order when asking for help:**
 - Use Ed Discussions for all assignments or lecture questions.
 - **TAs:** Full support and first-stop for **project** questions. Especially, if you need to debug your code, you need to go to the TAs first. They know the projects very well.
 - **TA (Garrett, Joey):** Project Grade Inquires and Autograder issues.
 - **Instructor (Dong):** Homework and Exam Grade Inquires. *You can ask anything to your instructor. No limitations. However, it is suggested that if your questions fall into one of the categories above, try those people first for the quickest answer.*
- **When emailing instructors and TAs:**
 - 3S-1Q Rule:
 - Be **brief** and try to explain your concern in three or less sentences.
 - Be explicit in asking your question. Most of the emails without questions are ambiguous.
 - If you need to use more than three sentences in your emails, highlight the most important three sentences that summarize your email.



COLORADO SCHOOL OF MINES

- Emails that do not adhere to the 3S-1Q rule, may take longer to get a reply for.
- Follow-up:
 - We get hundreds of emails in a week and sometimes miss responding and follow-up. If we do not respond in 24-48 hours or after an expected event, please don't hesitate to remind us about your concern.

Sexual Misconduct, Discrimination, and Retaliation:

Discrimination, Harassment, and Sexual Misconduct of any type, including sexual harassment, sexual assault, dating violence, domestic violence, and stalking, are prohibited under the Policy Prohibiting Sexual Misconduct, Discrimination, and Retaliation. Please see the [Office for Institutional Equity website](#) for information on Sexual Misconduct and Discrimination.

As your instructor, it is my responsibility to foster a learning environment that supports diversity of thoughts, perspectives and experiences, honors your identities, and is free of discrimination. Please feel free to speak to me if the class is not living up to these standards. Please note that I am also a mandatory reporter as an instructor at Mines, and if I receive a disclosure of Discrimination, Harassment, and/or Sexual Misconduct, I am required to report it to the Title IX Coordinator.

Preferred First Name Project:

Mines recognizes members of the campus community may prefer to use a first name other than their legal name to identify themselves. Many services on campus, like Canvas, utilize and display preferred first names. Additional information on preferred name, including how to update your preferred name, is available at the [Office For Institutional Equity website](#).

Academic Integrity:

Colorado School of Mines affirms the principle that all individuals associated with the Mines academic community have a responsibility for establishing, maintaining, and fostering an understanding and appreciation for academic integrity. In broad terms, this implies protecting the environment of mutual trust within which scholarly exchange occurs, supporting the ability of the faculty to fairly and effectively evaluate every student's academic achievement, and giving credence to the university's educational mission, its scholarly objectives, and the substance of the degrees it awards. We desire an environment free of any and all forms of academic misconduct and expects students to act with integrity at all times. Please read the [full academic misconduct/integrity policy](#) for full definitions of academic misconduct. Additionally, please use [resources provided by the Office of Community Standards](#) for guidance should you need to know more about the procedures of the policy for academic misconduct/integrity.

Plagiarism Policy for Projects, Homework and Exams:

- All work is to be completed individually.
- For projects, we will use source-code similarity software and compare your projects with current and past semesters' submissions.
- Please read "Generative Artificial Intelligence Usage" and "Academic Integrity" sections below for further details on what counts as plagiarism and what does not.



- **Any assignment identified as a derivative (35%) of another submission will result in disciplinary action.**

Generative Artificial Intelligence:

The Office of the Provost encourages the entire University community to explore the uses and impacts of GenAI technologies, whether through critical discussions or creative applications. Based on a review of the most recent [Guidelines for Using Generative Artificial Intelligence at Colorado School of Mines](#), the GenAI policy for this course will be:

By submitting work for evaluation in this course, you represent it as your own intellectual product. Submitting content for evaluation (e.g., ideas, text, code, images) that was generated, in whole or in part, by Generative Artificial Intelligence tools (including, but not limited to, ChatGPT and other large language models) would be considered Academic Misconduct in violation of Mines Academic Integrity/Misconduct Policy unless granted permission to do so. We will explain to you the specific uses of genAI tools that are permitted or prohibited in this course, including on what specific assignments use of genAI tools is permitted.

Resource	Permitted	Permitted with Citation	Prohibited
ChatGPT, Gemini, CoPilot, or other artificial intelligence for brainstorming or understanding or debugging (not creating) your homework and programming and lecture concepts		X	
ChatGPT, Gemini, CoPilot, or other artificial intelligence for generating/creating project code, see Academic Integrity			X
Chegg, Course Hero, Quizlet, and similar sites focused on academic assessments.			X
Classmates in your assigned group.			X
Course materials on Canvas.	X		
Course materials not on Canvas.		X	
Arthur Lakes Library Research Services	X		



COLORADO SCHOOL OF MINES

Google translate, other translation services and tools, or other tools of “artificial intelligence” (broadly interpreted).		X	
<u>Writing Center</u>	X		
Material from outside of this course (e.g., library books, notes from other courses, online material, Wikipedia, YouTube videos, etc).		X	
Material from students formerly enrolled in the course (when used without permission, this may result in academic integrity/misconduct investigations for all students involved).			X
Notes page designated for this purpose (e.g., you may bring one page of notes to an in-class exam).	X		
Notes taken in course meetings (including office hour meetings).	X		
Other people (not classmates as noted above).			X
Recorded lectures (from this class, if recording was done or permitted by instructor).	X		
Recorded lectures, talks, podcasts, videos (from a source other than this class).		X	
A tutor (from CASA's Tutor Program or elsewhere at Mines).	X		
A tutor not affiliated with a Mines service.			X
All other resources not specified, unless you receive direction otherwise from the course leaders.			X
Copying (including and pasting) text or answers from a resource without citation or if that resource is prohibited.			X



COLORADO SCHOOL OF MINES

Course Issues and Concerns:

As part of good professional practice, students are encouraged to speak with the faculty directly to raise issues and concerns with regards to the course professionally in compliance with the student code of conduct. Students can also reach out to the course coordinator, Dong Chen at dongchen@mines.edu.

Feedback:

The instructors will pursue continuous feedback from the students. The following channels will be used for active feedback:

- In-class polls: There will be random polls during the class. These polls can be about anything: In-class understanding, deadline postponing, recitation topics etc. You need to be "in class" to have your opinions considered for such decisions.
- **You are "highly" welcome to share ANY of your concerns or thoughts about ANY topics at ANY time by ANY means they would like to. All feedback will be taken into consideration.**

Assignment Submission:

- **Homework:** Format and submit your homework as instructed in the assignment on Canvas. Improper submission or formatting may result in a penalty on assignments.
- **Projects:** All submissions will be done via **Gradescope**. No email submissions will be accepted.

Additional Class Policies:

- **Assignments:** The assignment write-ups will be posted on the Canvas course website, along with the due dates. Submit PDF copies of homework assignments via Canvas. All assignments are due at the date and time stated in Denver local time, except for extenuating circumstances.
- **Class Attendance:** Class attendance will be implicit and randomly taken during feedback polls and pop quizzes. *Decisions on borderline grades will be based upon exceptional class attendance and participation, as deemed merited by the course instructor.* Of course, if you have a good reason to miss class (e.g., you are sick, or you need to present a paper at a research conference, or you have a job interview, etc.), then it is not a problem. Please don't come to class if you think you have a contagious illness and notify the instructor if necessary. We will work with you to help keep you posted on class activities and material covered. In any case, it is your responsibility to catch up (or keep up) with all course material and announcements covered in class.
- **Grading Corrections:** Bring any assignment grading correction requests to the instructor or the Teaching Assistant within 1 week of receiving the grade, or before the end of the semester, whichever comes first. After that, your grade will not be adjusted. If you find any mistakes in grading, please let us know. Your grade will not be lowered.
- **Accommodation:** Please let the instructor know if you will need any accommodation throughout the semester. Such accommodation includes, but is not limited to disabilities, sickness, requiring extra-time in exams and projects, planned schedule conflicts etc. Make sure you leave the instructor enough time for such accommodation to be considered. Last-minute requests asking for extra time in assignments with no emergent causes will not be honored.



COLORADO SCHOOL OF MINES

- **Academic Integrity:** All students are advised to be familiar with university policy on Academic Integrity. In addition, the following Collaboration Policy exists for all CS@Mines courses.
 - If the project is an individual effort project, you are not allowed to give code you have developed to another student or use code provided by another student. If the project is a group project, you are only allowed to share code with your group members.
 - You are encouraged to discuss homework and final project assignments with other students in the class **and GenAI tools**, as long as the following rules are followed:
 - You view another student's code only for the purpose of offering/receiving debugging assistance. Students can only give advice on what problems to look for; they cannot debug your code for you. All changes to your code must be made by you.
 - Your discussion is subject to the **empty hands policy**, which means you leave the discussion without any record [electronic, mechanical, or otherwise] of the discussion.
 - Submitting any material from any outside sources such as books, projects, artificial intelligence tools, and in particular, from the Web, is NOT allowed.
 - You may take a few lines of code from the online manual (i.e., MAN) pages that explains the use of a library function or a system call.
 - However, you may not take a chunk of code from any resources (including GenAI tools), especially if it includes a full or partial solution to the problem being asked in the project.
 - Please check with instructors or TAs if you are in doubt.
- If you are aware of students violating this policy, you are encouraged to inform the professor of the course. **Violating this policy will be treated as an academic misconduct for all students involved.** See the Student Handbook for details on academic dishonesty.
- Violations of this policy result in one of a range of punitive measures, from **a zero score for an assignment, up to and including a course letter grade drop for all students involved.** All issues of misconduct are reported to the Dean of Students. **Academic misconduct associated with an exam grade will likely result in course failure.**

Disability Support Services:

Disability Support Services (DSS) works collaboratively with students, faculty, and staff to minimize barriers and support an accessible campus community. When barriers to access occur, Disability Support Services works one-on-one with students to determine accommodations and facilitate access to programs and services. If you've been approved for accommodations through Disability Support Services, please contact your professor to confirm receipt of your accommodation letter and to discuss the implementation of accommodations in this course. Please visit mines.edu/disability-support-services for more information or to request accommodations.

Digital Accessibility:



COLORADO SCHOOL OF MINES

The Colorado School of Mines is committed to supporting an accessible digital environment for all members of our community, including students with disabilities. If you have an accessibility concern with Canvas or any digital materials or software used in this course, please contact your professor or request support from Information & Technology Solutions. Please visit <https://www.mines.edu/accessibility/> for more information.

Student Outreach & Support (SOS) Resources:

If you feel overwhelmed, anxious, depressed, distressed, mentally or physically unhealthy, or concerned about your wellbeing overall, there are resources both on- and off-campus available to you. If you need assistance, please ask for help from a trusted faculty or staff member, fellow student, or submit a referral for yours. As a community of care, we can help one another get through difficult times. If you are concerned for another student, offer assistance and/or ask for help on their behalf. Students seeking resources for themselves, or others should visit mines.edu/sos.

Student Outreach and Support can help connect you with a variety of resources; some of those might include:

- Counseling Center – <https://www.mines.edu/counseling-center/> or students may call to make an appointment. There are also online resources for students on the website. Located in the Wellness Center 2nd floor. Located at 1770 Elm St.
- Health Center - <https://www.mines.edu/student-health/> or students may call to make an appointment. Located in Wellness Center 1st floor.
- Colorado Crisis Services - For crisis support 24 hrs/7 days, either by phone, text, or in person, Colorado Crisis Services is a great confidential resource, available to anyone. <http://coloradocrisiservices.org>, 1-844-493-8255, or text "TALK" to 38255. Walk-in location addresses are posted on the website.

In an emergency, you should call 911, and they will dispatch a Mines or Golden PD officer to assist.

Diversity and Inclusion:

At Colorado School of Mines, we understand that a diverse and inclusive learning environment inspires creativity and innovation, which are essential to the engineering process. We also know that in order to address current and emerging national and global challenges, it is important to learn with and from people who have different backgrounds, thoughts, and experiences.

Our students represent every state in the nation and more than 90 countries around the world, and we continue to make progress in the areas of diversity and inclusion by providing [Diversity and Inclusion programs and services](#) to support these efforts.

Center for Academic Services and Advising (CASA):

CASA provides a variety of services to support students during their time at Mines. Please see www.mines.edu/casa for a complete list of current support services.

The Writing Center:



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The Writing Center is a free academic support service for undergraduate and graduate students. Professional consultants and peer tutors provide support with all forms of communication including technical and scientific reports, academic essays, and oral presentations. Students can make an online or in-person appointment at any stage of their project, from brainstorming to final revisions.

To learn more about their services and to make an appointment, please visit writing.mines.edu. For questions, please e-mail writing@mines.edu

Participating in this Course

Expectations for Participation:

- You are all encouraged to actively participate in project and assignment discussions on Ed Discussion and provide feedback to your peers.
- Answering other students' questions on Ed Discussion will be weighted heavier when calculating extra participation credits.
- We will take random attendance and sometimes pop-quizzes, which will count towards extra participation credits. Note that, attendance will be considered as extra credits (up to 3%).

Profile in Canvas:

As part of the learning experience at the Colorado School of Mines, our class will be utilizing online learning resources and experiences through the Canvas learning management system. In order to help build community in this online learning environment, you are encouraged to **upload your profile picture to Canvas**. Photos should be similar to the photos taken for passports or state identification cards.

Expectations of online etiquette or netiquette:

Here are few do's and don'ts about communicating in your course through emails or in online discussion forums:

- Do...
 - Ask questions and engage in conversations as often as possible—feel free to contact the instructor via the discussion forum for questions or via email or other communication.
 - Be patient and respectful of others and their ideas and opinions they post online.
 - Remember to be thoughtful and use professional language. Keep in mind that things often come across differently in written text, so review your writing before posting.
 - Be prepared for some delays in response time, as "virtual" communication tends to be slower than "face-to-face" communication.
 - Contact the instructor if you feel that inappropriate content or behavior has occurred as part of the course.
 - Check the syllabus and course policies stated by your instructor to know what to expect about your instructor's turnaround time for responding.
- Do NOT...



- Use inappropriate language—this includes, but is not limited to, the use of curse words, swearing, or language that is derogatory.
- Post inappropriate materials—for example, accidentally posting/showing a picture that is not appropriate for the course content.
- Post in ALL CAPS, as this is perceived as shouting and avoid abbreviations and informal language ("I'LL C U L8R").
- Send heated messages even if you are provoked. Likewise, if you should happen to receive a heated message, do not respond to it.
- Send an email or post to the entire class, unless you feel that everyone must read it.

Course Schedule

- The planned course schedule is posted at course landing page ("Class Schedule").
- This schedule is tentative and the future posting, and deadline dates may change. All deadlines are assumed to be met by 11:59:59 pm in Denver local time.