ILLINOIS TECH

CS 450: Operating Systems

Spring 2024
3 credit hours
Mondays and Wednesdays 3:15 PM - 4:30 PM

Instructor	Email	Office Hours
Dr. Farshad Ghanei	fgh@iit.edu	SB 208B WED 5-7

Teaching Assistants

Course Website

Blackboard: Resources and assignment submissions info
Piazza (Automatic enrollment by instructor): Announcements, Q&A, discussions
https://piazza.com/iit/spring2024/cs450

Please do not hesitate to participate during lecture or make an appointment for assistance. You should never hesitate to ask questions, whether it be a simple/fundamental question, something more advanced that you are interested in, or simply to chat about the material/department/life in general. Remember that you are always welcome with any level of question and should not be shy to ask.

Note: If you need to email course staff, make sure you include **CS450** at the beginning of the subject line so your email is not missed. **Email without this subject or from non-IIT accounts will be ignored.**

Communication is critical to the success and satisfaction of the learning experience. Please email me about any class issues.

Course Description

Introduction to operating system concepts-including system organization for uniprocessors and multiprocessors, scheduling algorithms, process management, deadlocks, paging and segmentation, files and protection, and process coordination and communication.

Course Prerequisites

CS 351 CS 401 or CSSP 401 and CS 402 or CSSP 402 or CS 403

Learning Outcomes

After successfully completing this class, students should be able to:

1. Define different OS design techniques.
2. Explain process management, processor scheduling, concurrent programming, deadlocks and synchronization, memory management, file management and I/O systems, disk scheduling.
3. Distinguish main memory and virtual memory.
4. Recognize user level and kernel level programming differences.
5. Understand how kernel operates and schedules processes
6. Program synchronization in multi-threaded programs.
7. Design kernel interface with programs
8. Incorporate all above into designing and implementing a system

Classroom Decorum

Students are expected to be present in class, and not be distracted or distracting to others. Usage of laptop/cell phones in class is discouraged.

Technology Requirements

Students will need access to a computer and internet. Availability of Zoom, and the use of audio and video is expected. Please install the software and keep it updated. Make sure your webcam and microphone work properly. IIT Email, Piazza, Blackboard, and other software will be used this semester. x86-64 compatible computers are preferred. You may face issues with M1/M2 computers.

Textbook

zyBook Course: CS 450 Operating Systems (Required)
zyBook Code: IITCS450GhaneiSpring2024
ISBN: 979-8-203-27889-0
List Price: $64
Should be available in Bookstore.
Students may begin subscribing on Dec 25, 2023 and the cutoff to subscribe is Apr 24, 2024. Subscriptions will last until May 24, 2024.
1. Click any zyBooks assignment link in your learning management system
(**Do not** go to the zyBooks website and create a new account)
2. Subscribe

Recommended Supplementary Text
Operating System Concepts (9th Edition)
A. Silberschatz, P.B. Galvin, and G. Gagne. Wiley Publishers, 2012
ISBN: 978-1-118-06333-0

The C Programming Language
B. Kernighan and D. Ritchie. Prentice Hall, Inc., 1988
ISBN 0-13-110362-8

Advanced Programming in the UNIX(R) Environment
W. Stevens, Addison Wesley Longman Publishing Co., Inc. 1992
ISBN 0-201-56317-7

Emails/Piazza

Students are responsible for emails sent to their official IIT email address. A level of professionalism is expected with all communications.
It is understood that there is a large amount of email correspondence expected, please be patient with responses.
Please make sure to include **CS450** in the subject line. Emails without this subject, from non-IIT accounts will be ignored.
All emails should be detailed enough to provide the context in which course staff can support you. Emails that are not clear only serve to delay the information you need.

We will use Piazza for class discussion and questions. The system is highly efficient and faster than email, in order to ask your questions from classmates or teaching staff. Students are **required** to check Piazza frequently and read all instructor announcements. (Link on the first page). Students are expected to participate and ask questions. General course/material related questions should be posted publicly, whereas questions related to your assignments should be posted privately. Public posts can be anonymous.
Make sure you include **"instructors",** so it is visible to all teaching staff. Private posts to a single instructor/TA will be ignored.

Every student is expected to participate on Piazza and post a public course-related question/response by the end of the **6th week**.

Course Requirements

Lectures

Attending the class and active participation is highly recommended and expected. Lectures are requested to be recorded, but there is no guarantee and technical issues may arise. In-class attendance and quizzes will be taken. Students are expected to take notes during class.

Assignments

Most of the assignments in this class will require you to read and write a substantial amount of code in C. All programming assignments will be submitted via version control system, with specific directions included in the assignment writeup.

zyBook Assignments

There will be assignments from the zyBook, on a weekly basis. The assignments aim to ensure that you study regularly for the material covered in class, and you are prepared for the projects. You should **NOT** access their website directly. **You need to access the assignment from Blackboard** in order to transfer the completion and get the grade. Otherwise you may receive 0 on assignments.

Programming Assignments

There will be three programming assignments (PA) throughout the course. These assignments aim to implement some core Operating System components for better understanding the concepts, and they require programming background in C and UNIX programming experience.

Programming assignments form a major component of your grade. They are very time-consuming and need your **very early engagement**. PA0 is a warm-up for the environment. PA1 and PA2 are divided in 3 phases each. Only PA0 is an individual assignment. PA1, PA2 are meant to be completed by a group of 3 students. Groups will be assigned randomly. Proper communication, planning, and task delegation is required to achieve good results. Keep major communications and task delegations in written format (e.g. email), and make sure each member's contributions are clear. We will make use of private git repositories for programming assignments. **Students are required to commit and push frequently**, in order to seek help in office hours/Piazza/etc. Every time project code compiles and runs with a higher score, students must make a commit. Lack of incremental commits will lead to loss of points by up to 50%.

Exams

There will be one midterm-exam taken during the lecture, and a final exam at the end of the semester. All tests are to be taken individually and without the use of any resource except those explicitly allowed by the instructor. Students may be recorded during exams. These videos are not meant to be uploaded anywhere. But they are to ensure the integrity of the test. Exams will be individual work, closed book, closed notes, no electronic devices, no internet, no questions answered, no bathroom breaks, and assigned seats.

Date	Subject
Midterm Wednesday March 6	Topics covered to date (details will be specified)
Final TBD (April 29-May 4)	All topics covered during the semester

For the exams, students **must prepare, submit and bring a single letter-sized, double sided, self-hand-written (only pen/pencil), resource sheet** to the exam. First page **must be digitally submitted a day prior to the exam.**

Students are recommended to (Michael de Raadt, "Students Created Cheat-Sheets in Examinations: Impact on Student Outcomes", ACE2012):

- Study well, review, and order the content of the cheat sheet to match course content.
- Include generalized and abstract representation of concepts, rather than specific examples.
- Avoid including samples and examples

The resource sheet is **required** and forms a portion of the exam grade.

Make-up Exams

No make-up exams will be given except in provably extreme circumstances. Please note the following additional policies/suggestions with respect to make-up exams:

- Notify your instructor 7 days prior to the exam via email if you are going to miss an exam for planned reasons. These reasons must satisfy the university accommodation policy.
- If you miss an examination because of sickness or similar reasons, visit a physician and obtain a note detailing the period and the reason you were medically incapable of taking the exam. If it is medically impossible for you to give prior notice, please obtain a note from a physician detailing the period (and the reason) you were medically incapable of communicating with the instructor.
- Exam times are stressful, and one could forget about the exam time. Please make sure you arrange for multiple reminders so that you do not forget about the exam(s).

Submission policy

All submissions will need to be on the server, as specified by the instructions. If you submit an incorrect file/corrupted file/empty file/not what you intended, it is **your responsibility** to ensure you correct this (you may simply submit again to overwrite your previous submission). Always check your submitted files **immediately** after submission. A file that is corrupted, incorrect, or of the wrong format, will get **zero.**

Late Submissions

There is no late submission for quizzes or zyBook assignments.

Project Handins are due at 11:55 PM. Submissions before the deadline (anything marked as Friday or before) will incur 5% bonus points. Submissions are accepted up to 48 hours after the deadline (anything marked as Saturday or Sunday) with no bonus/penalty. Submissions won't be accepted after 48 hours. There won't be any instructional support during the weekends. Only server timestamps are considered, not students' local computers.

Grading Policy

Your grade will be comprised of:

20% Midterm Exam
30% Final Exam
5% PA0
20% PA1 (Split into three parts: 10% + 25% + 65%)
20% PA2 (Split into three parts: 15% + 20% + 65%)
5% zyBook Assignments
5% Quizzes
5% Participation and engagement (in-lecture and piazza)

*10% is considered extra/bonus. i.e. any grade above 100 will be considered 100.

In order to be eligible to pass the course, you must meet the following grade criteria:

- A minimum of 50% attendance in lecture
- A minimum of 15% in each and every programming assignment and exam.

Failure to meet any of these criteria will result in Failure in the course, independent of the overall grade.

Letter Grade	A	B	C	D	E
Points	90-100 points	80-90 points	70-80 points	60-70 points	< 60 points

Academic Integrity

Academic integrity is critical to the learning process. It is your responsibility as a student to complete your work in an honest fashion, upholding the expectations your individual instructors have for you in this regard. The ultimate goal is to ensure that you learn the content in your courses in accordance with academic integrity principles, regardless of whether instruction is in-person or remote. Thank you for upholding your own personal integrity and ensuring IIT's tradition of academic excellence. The academic integrity policy is available at:

https://www.iit.edu/student-affairs/student-handbook/fine-print/code-academic-honesty

Unless **explicitly** mentioned, all work is to be done independently with only the assistance of the instructors and teaching assistants. You may discuss the general concepts of assignments and clarification of what the question asks for with other students, but you must not discuss answers or how to get them.

Unauthorized collaboration will result in **Failure** in the course as a violation of academic integrity. This includes (but is not limited to) inappropriate posts on Piazza (the course discussion board) or any other discussion forum. Inappropriate is defined as any post which violates any behavioral or academic integrity policies. Using generative AI tools like ChatGPT, and looking up answers to questions on the web, etc., are considered to be cheating and will be penalized as deemed appropriate.

As an engineer or computer scientist, you have special ethical obligations. As per the NSPE Code of Ethics, "engineers shall avoid deceptive acts" and "shall conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession (https://www.nspe.org/resources/ethics/code-ethics). Similar sentiments of honesty, integrity, fairness, and responsibility are fundamental to the ACM Code of Ethics (https://www.acm.org/code-of-ethics).

Academic Integrity Amnesty

A student who has committed a violation of this academic integrity policy may receive limited amnesty for the violation by notifying me, in writing, of the violation **before I download the assignments for assessment**. This notification must include the student's name, email, and state the assignment in question and the nature of the violation. Upon submitting such a statement, the student will receive no credit for the violating assignment, but no further sanctions will be taken, and the violation will not be reported. Once I have begun assessing the assignment in question, no such statements will be permitted. Since it may not be obvious to students when assessment begins, such statements should be submitted as soon as possible after the violation occurs. While assessment may begin at any time, in general I will not look at student submissions until a project deadline has passed.

Accessibility Resources

If you have any disability which requires reasonable accommodations to enable you to participate in this course, please contact the Center for Disability Resources. The office will provide you with information and review appropriate arrangements for reasonable accommodations, which can be found on the web at: https://www.iit.edu/cdr/

Illinois Tech's Sexual Harassment and Discrimination Information

Illinois Tech prohibits all sexual harassment, sexual misconduct, and gender discrimination by any member of our community. This includes harassment among students, staff, or faculty. Sexual harassment of a student by a faculty member or sexual harassment of an employee by a supervisor is particularly serious. Such conduct may easily create an intimidating, hostile, or offensive environment. Illinois Tech encourages anyone experiencing sexual harassment or sexual misconduct to speak with the Office of Title IX Compliance for information on support options and the resolution process.

You can report sexual harassment electronically at https://iit.edu/incidentreport, which may be completed anonymously. You may additionally report by contacting the Title IX Coordinator, Virginia Foster at foster@iit.edu or the Deputy Title IX Coordinator at eespeland@iit.edu

For confidential support, you may reach Illinois Tech's Confidential Advisor at (773) 907-1062. You can also contact a licensed practitioner in Illinois Tech's Student Health and Wellness Center at student. health@iit.edu or (312)567-7550.

For a comprehensive list of resources regarding counseling services, medical assistance, legal assistance and visa and immigration services, you can visit the Office of Title IX Compliance website at https://www.iit.edu/title-ix/resources

Diversity

We consider the diversity of our students, faculty, and staff to be a strength, critical to our success. We are committed to providing a safe space and a culture of mutual respect and inclusiveness for all. We believe a community of faculty, students, and staff who bring diverse life experiences and perspectives leads to a superior working environment, and we welcome differences in race, ethnicity, gender, age, religion, language, intellectual and physical ability, sexual orientation, gender identity, faith and non-faith perspectives, socio-economic class, political ideology, education, primary language, family status, military experience, cognitive style, and communication style. We expect every student to contribute to an inclusive and respectful culture for all, in the classrooms and labs, in online forums, in work environments, and at campus events.

Distribution of Course Materials

All materials prepared and/or assigned by me for this course are for the students' educational benefit. Other than for permitted collaborative work, students may not photograph, record, reproduce, transmit, distribute, upload, sell or exchange course materials, without my prior written permission. "Course materials" include, but are not limited to, all instructor-prepared and assigned materials, such as lectures; lecture notes; discussion prompts; study aids; tests and assignments; and presentation materials such as *PowerPoint* slides, *Prezi* slides, or transparencies; and course packets or handouts. Public distribution of such materials may also constitute copyright infringement in violation of federal or state law. Violation of this policy may additionally subject a student to a finding of "academic dishonesty" under the Academic Integrity Policy and/or disciplinary charges under the Student Code of Conduct.
Materials used in connection with this course may be subject to copyright protection under Title 17 of the United States Code. Under certain Fair Use circumstances specified by law, copies may be made for private study, scholarship, or research. Electronic copies should not be shared with unauthorized users. If a user fails to comply with Fair Use restrictions, he/she may be liable for copyright infringement.