

CSE 330: Operating Systems

Contact Information

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Course Overview and Topics

The Operating System (OS) is one of the most critical component of modern machines—all the way from Raspberry Pis to supercomputers—because it controls hardware resources allocated to all other software.

In this course, we will discuss the fundamentals of operating systems including CPU-memory management, process scheduling, device drivers, and file systems. At the end of the course, students will be able to describe the inner workings of an Operating System, as well as optimize the algorithms controlling the operations of the different components of an Operating System.

Provided below is a tentative (more detailed) list of topics we will discuss:

- Kernel bootloader execution
- Process scheduling (e.g., time sharing with context management)
- Simultaneous multi-processing (e.g., locks, semaphores)
- Memory management (e.g., page tables, demand paging, page faults)
- Kernel-process interactions (e.g., system calls, interrupts)
- File systems (e.g., different kinds, transparent compression mechanisms)
- Device management (e.g., UART, storage, network)
- Kernel-level logging for forensic analysis (e.g., at system calls)
- Kernel attacks and protection mechanisms (e.g., ASLR, Data Execution Prevention)
- Virtualization extensions (e.g., Intel VMX, AMD SVM)
- Process protection mechanisms (e.g., enclaves)

Learning Outcomes

At the end of this course, students will have a theoretical and practical understanding of how an OS works, all the way from how it starts to how it can spawn even new operating systems through virtualization techniques. With this understanding, they will be expected to become proficient in systems-level programming on any operating system codebase (e.g., Linux, Windows).

Prerequisite Knowledge

The student is expected to have taken CSE 310: Data Structure and Algorithms. Additionally, the student is expected to be proficient in C programming and have knowledge of pointers.

Textbook and Reading

- **Primary:** Operating System Concepts, Silberschatz, Gagne, Galvin Tenth Edition, ISBN 978-1-119-80037-8
- **Secondary:** Operating Systems: Three Easy Pieces 1.00 Edition <https://pages.cs.wisc.edu/remzi/OSTEP/>

Feel free to ask the instructor for other recommendations!

Assessment (tentative)

This course will have a grade (A+, A, A-, B+, B, B-, C+, C, C-, D, E), assigned through an *absolute* grading scheme. A tentative version of that scheme is provided below.

Score (%)	Grade	Score (%)	Grade
≥95%	A+	90 - <95%	A
85 - <90%	A-	80 - <85%	B+
75 - <80%	B	70 - <75%	B-
65 - <70%	C+	60 - <65%	C
55 - <60%	C-	50 - <55%	D
<50%	E		

The main components for assessment are provided below:

1. **4 (Group) Projects (60%).** Provided below are some important details:
 - Each assignment will require implementing crucial OS functionality (e.g., scheduling, memory management) on top of a base OS implementation using C code.
 - **If modified code does not compile correctly, a student will get a zero.** The base code provided compiled correctly, and there is no reason for modified code not to compile.
 - Students will be provided some basic tests to run on their code before submission.
2. **Mid-term Examination (15%).** This will include all course material covered till a week before the midterm.
3. **Final Examination (15%).** This will include all the material learnt in the class and through assignments. Both the midterm and final exams might have some extra questions that can help boost your grade.
4. **5 Online Quizzes (10%).**
5. **Bonus (5–8%).** Through random in-person class attendance and questions in assignments/exams.

Late/Absent Work. Except as by prior arrangement or notification of an extension before the deadline, missing or late work will be counted as a zero/fail.

Syllabus Changes. Any information in this syllabus may be subject to change with reasonable advance notice.

Other Important Course Policies

Disability Accommodations. Suitable accommodations will be made for students having disabilities. Students needing accommodations must register with the ASU Disabilities Resource Center and provide documentation of that registration to the instructor. Students should communicate the need for an accommodation in sufficient time for it to be properly arranged. See [ACD 304-08 Classroom and Testing Accommodations for Students with Disabilities](#).

Academic Integrity. Students in this class must adhere to ASU's academic integrity policy, which can be found at [ASU Academic Integrity Policy Link](#). Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty can occur. In addition, all engineering students are expected to adhere to both the ASU Academic Integrity Honor Code and the Fulton Schools of Engineering Honor Code. All academic integrity violations will be reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). The AIO maintains record of all violations and has access to academic integrity violations committed in all other ASU college/schools.

Expected Classroom Behavior. Every student is expected to behave in a courteous manner. You are free to use a cellphone, tablet, or audio/video recording device, to aid your study.

Copyright. Course content, including lectures, are copyrighted materials and students may not share outside the class, upload to online websites not approved by the instructor, sell, or distribute course content or notes taken during the conduct of the course (see [ACD 304-06](#), "Commercial Note Taking Services" and [ABOR Policy 5-308 F.14](#) for more information). You must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.

Threatening Behavior Reporting. Students, faculty, staff, and other individuals do not have an unqualified right of access to university grounds, property, or services. Interfering with the peaceful conduct of university-related business or activities or remaining on campus grounds after a request to leave may be considered a crime. All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students.

Harassment and Sexual Discrimination. Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment, and retaliation by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information.

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at [Sexual Violence Prevention FAQs](#).

Mandated sexual harassment reporter: As a mandated reporter, I (the instructor) am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. [ASU Counseling Services](#) is available if you wish discuss any concerns confidentially and privately.