

# CS 433 Operating Systems

Fall 2022 (section 01)

Instructor:	Dr. Xiaoyu Zhang
Class meetings:	MWF 10:30 – 11:20
Office hours:	MWF 11:30 - 12:30 @ SCI2 225
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## COURSE DESCRIPTION

This course examines fundamental issues in operating system design and implementation. The operating system provides a well-known, convenient, and efficient interface between user programs and the bare hardware of the computer on which they run. The course will cover the major components of modern operating systems. Topics include process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), file systems, and security. The course will provide essential building blocks to construct complex, real-world software systems.

## STUDENT LEARNING OUTCOMES (SLOS)

After taking this course, students should be able to

- Explain modern operating systems' objectives and functions and analyze the inherent tradeoffs in OS design.
- Contrast kernel and user mode in an operating system and discuss the values of interrupt processing, system calls, and APIs.
- Describe the difference between processes and threads.
- Compare and contrast process communications using shared memory and message passing.
- Compare and contrast the common algorithms used for scheduling tasks in operating systems.
- Demonstrate the potential run-time problems arising from the concurrent operation of many separate tasks and summarize techniques for achieving synchronization in an operating system.
- Describe the causes of deadlocks and approaches to handle them.
- Compare and contrast the different ways of allocating memory to tasks.
- Summarize the principles and evaluate the performance of virtual memory.
- Compare and contrast different approaches to file system design and implementation.

## PREREQUISITES

CS 311 and CS 231 (CS 331 recommended)

## TEXTBOOKS

- **Required:** zybook "[Operating System Concepts](#)" by Abraham Silberschatz, Peter Galvin, Greg Gagne
  1. Sign in or create an account at [learn.zybooks.com](http://learn.zybooks.com) using your campus email
  2. Enter zyBook code: CSUSMCS433ZhangFall2022
  3. Subscribe
- "[Operating Systems: Three Easy Pieces](#)" by Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau (Freely available online)

## GRADING

Your final score will be compiled from the following parts:

Programming Assignments:	40%
Online Homework Questions:	15%
Zybook Reading (Participation activities):	5%
Class Participation:	5%
Midterm Exam:	15%
Final Exam:	20%

Your letter grade will be based on the following scale:

Grade	Total %
A	$\geq 90$
B	$80 \leq \text{and} < 90$
C	$70 \leq \text{and} < 80$
D	$60 \leq \text{and} < 70$
F	$< 60$

*The above is an absolute scale. You can guarantee yourself a particular grade by attaining the appropriate overall percentage. I may curve up the exams according to the distribution of student scores.*

## COURSE POLICIES

1. To be successful in this course, you should prepare before the class, actively participate during the class, and review and study after the lectures. It is very difficult to grasp the details from the lectures alone. To gain a better understanding and more knowledge of operating systems, You should read the textbook, including materials we don't have time to cover in detail. Readings and participation activities will be assigned on the zybook. Students should read materials to be covered BEFORE the lectures. After lectures, you should re-read the textbook sections and other resources to gain a clear understanding.
2. Zybook reading and participation activities must be completed before the due date. No exception.

3. Students should actively participate during the class sessions to gain the most out of the course. Ask questions if things are not clear to you. The participation score will be determined according to attendance and participation in in-class group discussions and answering questions.
4. Online homework questions must be completed and turned in on time. No exception because answers will be available after the due date.
5. You are encouraged to use the discussions on Canvas for course-related questions. If you have some questions related to the course, it is better to post the questions on the forum than email the instructor. I will monitor the forum constantly and try to answer the questions as soon as possible. Other students may be able to answer your questions sooner. Furthermore, your questions and answers may be helpful to other students as well.
6. We will use C/C++ for all programming assignments on a Linux computer, e.g., `cs433.cs.csusm.edu`. Read the instructions on how to submit programming assignments carefully.
7. There are five programming assignments that are crucial for your learning in this course. **All programming assignments must be submitted before the due date.** No late assignment will be accepted without prior agreement from the instructor. As writing and debugging programs can be time-consuming, *always start early on the programming assignments* so that you can get early feedback and have time to fix bugs.
8. You may work in a group of two for the programming assignments. Students in a group will turn in one copy of the program and receive the same grades for the programming assignments. You should remain in the same group throughout the entire semester. Any group change later during the semester must be approved by the instructor.
9. Any request for regrading must be submitted to the instructor ASAP via email, within one week from when the grades are available for the class (not the day you view it).
10. Make sure you come to the midterm and final exams. No makeup exam will be given.
11. The University writing requirements will be satisfied by programming reports.
12. **Academic Honesty and Integrity:** Students are responsible for the honest completion and representation of their work. Your course catalog details the ethical standards and penalties for infractions. We encourage you to help one another in understanding the concepts, algorithms, or approaches needed to do the homework assignments for this class. However, what you turn in must be your own, or for group projects, your group's own work. Copying (or slightly modifying) other people's code, solution sets, or from any other sources is strictly prohibited. Sharing your solutions (or nearly completed ones) with others is also considered a violation of academic integrity. There will be zero tolerance for infractions. If you believe there has been an infraction by someone in the class, please bring it to the instructor's attention. The instructor reserves the right to discipline any student for academic dishonesty in accordance with the general rules and regulations of the university. Disciplinary action may include the lowering of grades and/or the assignment of a failing grade for an exam, assignment, or the class as a

whole. Academic dishonesty cases will be referred to the Dean of Students Office and may result in suspension or expulsion from CSU San Marcos and the CSU System.

13. Students with disabilities who require reasonable accommodations must be approved for services by providing appropriate and recent documentation to the Office of Disability Support (DSS). This office is located in Craven Hall 4200 and can be contacted by phone at (760) 750-4905 or TTY (760) 750- 4909. Email inquiries can be sent to [dss@csusm.edu](mailto:dss@csusm.edu). Students authorized by DSS to receive reasonable accommodations should email me to ensure confidentiality.

## SCHEDULE

Please note that this schedule is tentative and subject to change.

Date	Topics	Readings
week 1 – 2	Discussion of the syllabus. Introduction	Chap 1 & 2
week 2 – 3	Processes	Chap 3
week 3 – 4	Threads & Concurrency	Chap 4
week 5 – 6	CPU Scheduling	Chap 5
week 7 – 8	Process synchronization	Chap 6-7
	<i>Midterm Exam</i>	
week 9	Process synchronization	Chap 6-7
week10	Deadlocks	Chap 8
week 11-12	Main Memory	Chap 9
week 12-13	Virtual Memory	Chap 10
week 14-15	File Systems	Chap 11-12