**Last Update: 12-31-2025**

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| **Course** | **CSC 453 Operating Systems** |
| **Lecture** | Section 05: TR 12:10 - 13:30, 186-C300 |
| **Lab** | Section 06: TR 13:40 - 15:00, 014-255 |
| **Instructor** | Paul Schmitt |
| **Office** | In person: Building 14-204<br>Virtual: https://calpoly.zoom.us/my/paulschmitt |
| **Office Hours** | In person: W 12:00-15:00, by appointment<br>Virtual: By appointment |
| **Email** | prs@calpoly.edu, (please put "**[CSC 453]**" in subject line) |
| **Web Page** | https://canvas.calpoly.edu/courses/168889 |

# Course Description

The course will focus on the theory, practice, and technologies used to build and reason about modern operating systems. This course is a broad survey of the field, and its overarching goal is to give students a taste of the core principles that affect the design, evaluation or simply, the popular understanding of modern operating systems.

# Textbooks

Operating Systems: Three Easy Pieces, Version 1.10, R.H Arpaci-Dusseau and A. C. Arpaci-Dusseau.

# Prerequisites

*Required*: CSC/CPE 357, and CSC/CPE 225 or CPE/EE 229 or CPE/EE 233

# Learning Objectives

The course will examine the requirements for and structure of a modern operating system, including the fundamental problems of resource allocation and management of concurrent processes. By the end of the quarter students will be expected to be able to:

1. Describe basic operating systems concepts.
2. Utilize the system call interface and describe how it is implemented.

3. Implement basic techniques for managing concurrency, including critical sections, synchronization, and deadlock detection and avoidance.
4. Explain the process by which a computer boots, including how an operating systems is loaded and given control over the hardware.
5. Critically discuss the tradeoffs and merits of various operating system algorithms, such as those used for page replacement, disk scheduling, and process scheduling.
6. Implement and justify the basic structure and design decisions of memory and file systems.
7. Explain the operating system's role in securing a computer.

## Topics

| Weeks | Topic | Subtopics |
|-------|-------|-----------|
| 1 | Introduction to Operating System Concepts | What is an operating system? Systems calls, A brief history of OSes, Common OS structures. |
| 3 | Processes & Threads | The Process Model, Parallelism & Pseudo-parallelism, Managing Concurrency (critical sections), Scheduling |
| 2 | Synchronization & Deadlocks | Locks, Semaphores, Monitors, Message Passing, Deadlock Prevention, Detection & Avoidance |
| 2 | Memory | Common Memory System Designs, Swapping, Virtual Memory, Page Replacement |
| 1 | File & Storage Systems | Common File System Design and implementation, Performance Characteristics, Relation to Underlying Storage Device, Consistency, Reliability, Scalability, Security |
| 1 | Security | Discretionary Access Control, Mandatory Access Control, Multilevel Security, Covert Channels, Trusted Computing, Memory Protection, Cryptography |

## Teaching Modalities

This course will balance lectures with hands-on assignments and lab work. The course has three lecture hours and three lab hours scheduled per week. Both the lecture and lab sessions will be opportunities for the instructor to present course material, although the former will primarily be used for instruction.

# Readings

Readings for the course textbook will be assigned via the course schedule on Canvas, and it is strongly suggested students read **before** the associated lecture.

# Quizzes, Homework & Programming Assignments

Coursework will consist of weekly online quizzes, lab exercises, and (at least) four large programming assignments. All assignments will be posted on Canvas.

All work is expected to be done individually, unless you have received expressed written consent (not implied oral consent) by the instructor.

All homework and programming assignments will be submitted using Canvas. Written exercises are to be submitted in **plain text** with each response **clearly** attributed to the assigned problem. Repeating the problem statement is not required. Instructions for submitted programming assignments are provided in each assignment. **NOTE:** Be careful to submit your final version and to have tested it before submitting. *Programs that fail to compile or run will receive no credit.* All code must compile and run on a department unix*.csc.calpoly.edu for credit. We will use the C99 standard for all C code.

# Late Policy

You are responsible for keeping track of posted assignments and their due date/time. Assignments turned in late will not be accepted **unless you use a Late Pass**. Each student has 3 total Late Pass days for the quarter (for example: one 3-day extension, one 2-day plus one 1-day extension, or three separate 1-day extensions). Late passes can be used for any programming assignment or quiz.

To use a Late Pass, you **must contact me at least 4 hours before the assignment deadline** to request it. Late Passes cannot be applied retroactively and cannot be divided into smaller increments than one day.

In the case of group assignments, the min() Late Pass balance of the group's members is available (i.e., if someone in the group only has 1 Late Pass remaining and the others have 3, the group can only use up to 1).

Once your Late Pass days are used up, **no further late work will be accepted**. Plan carefully and use them only when necessary.

# Email

When you email the instructor, please put the class name in the subject line (*i.e.*, [CSC 453]).

All email correspondence must adhere to academic and professional guidelines.

# Exams

Three exams–two midterms and one final–will be given with their dates to be determined. All will be in-class and **closed-book, closed-notes, closed-neighbor**. Makeup exams will only be given under **extreme** circumstances.

## Dates

Midterm 1: On or about Thursday, January 29 2026, in-lecture

Midterm 2: On or about Tuesday, February 24 2026, in-lecture

Final: Thursday, March 19 2026, 13:10-16:00, in normal lecture room

# Grade Breakdown

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|---|---|
| Programming Assignments | 25% |
| Quizzes / Labs | 15% |
| Midterm Exams | 35% |
| Final Exam | 25% |

## Letter Grades:

| | |
|---|---|
| A: | >=94 |
| A-: | >=90 |
| B+: | >=87 |
| B: | >=84 |
| B-: | >=80 |
| C+: | >=77 |
| C: | >=74 |
| C-: | >=70 |
| D: | >=60 |
| F: | <60 |

**All graded work is compulsory**. The instructor reserves the right to amend this breakdown at any time.

# Conduct In Class

Please silence your cell phones and refrain from engaging in activities that might distract your

fellow classmates (e.g., surfing the web). Attending lectures and labs are not compulsory, so if you don't want to be there, don't make it harder for someone who does.

# Academic Integrity

## Collaboration

All assignments in this class are intended to be demonstrations of individual or, in the case of a group assignment, partnership abilities. To this end, programs are to be written only by the designated author(s). High-level discussion of problems and problem-solving techniques, however, is beneficial to all involved. You are encouraged to discuss approaches so long as those with whom you consult are given due credit in your program headers.

**It is never acceptable to allow someone else to use your work for reference while writing your own.**

In this case, "someone else's work" means not only other students' programs, but also materials from any other source, including, but not limited to, the world wide web, other reference books, or previous course materials, artificial intelligences. Collaboration that goes beyond general approaches or that is uncredited will be considered cheating. If you are unsure about what constitutes proper or improper collaboration, consult the instructor for guidance.

## Cheating

Academic dishonesty is a serious offense, taken seriously. Any instances of cheating or plagiarism will be referred to the Office of Student Rights and Responsibilities. The Cal Poly rules and policies are listed in the catalog, as well as at the OSRR web site, http://www.osrr.calpoly.edu. My general policy, however, is very simply:

**Cheating will result in an "F" course grade.**

Turning in work is presumed to be a claim of authorship unless explicitly stated otherwise. If the course rules are unclear or you are unsure of how they apply, ask the instructor beforehand.

# A Final Disclaimer

This document is a "living" document, and is subject to change at any time. If you have a question about the conduct of the course, please first refer to the "live" document, and not a copy. Any remaining unanswered questions should be directed to the instructor.