San José State University
Department of Computer Engineering

CMPE 142
Operating Systems

Section 1
Spring 2021

Course and Contact Information

Instructor:	Ron Mak
Office location:	ENG 250 (but working from home)
Email:	ron.mak@sjsu.edu
Website:	http://www.cs.sjsu.edu/~mak/
Office hours:	TuTh 4:30 - 5:30 PM online via Zoom
Class days/time:	F 12:00 noon - 2:45 PM online via Zoom
Classroom:	Zoom
Prerequisites:	CMPE 102, CMPE 126 (all with grades of "C-" or better). Computer Engineering or Software Engineering Majors Only.

Course Catalog Description

"Overview: history, concepts, system calls and structures. Management of major components: processes, memory, input/output and files. Design of system calls and device drivers for hardware independence. Concepts of kernel and shell, file protection and interactive computation."

Course Format

This course adopts a synchronous online classroom delivery format. To participate in classroom activities, submit assignments, and take tests/exams remotely, a student must have a computer with adequate internet connection and bandwidth for accessing Canvas and attending Zoom video meetings. A smartphone or tablet with a camera capable of running Zoom is also needed for video recording of your test environment during the tests/exams.

Faculty Web Page and Canvas

Course materials, syllabus, assignments, grading criteria, exams, and other information will be posted at my faculty website at http://www.cs.sjsu.edu/~mak and on the Canvas Learning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking these websites to learn of any updates. For help with using Canvas see the Canvas Student Resources page at http://www.sjsu.edu/ecampus/teaching-tools/canvas/student_resources.

Course Goals

This class will use UNIX, Linux, and the POSIX standard as examples throughout the semester. Students will get practical hands-on interactive and programming experience to acquire real-world skills desired by employers.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

CLO 1: Identify and formulate the concepts and principles underlying the structures and designs of operating systems.

CLO 2: Solve problems involving processes and threads and their roles in program execution.

CLO 3: Identify and solve problems involving scheduling and synchronizing processes/threads.

CLO 4: Formulate how to manage a computer's main memory.

CLO 5: Solve problems involving file systems and data storage.

CLO 6 Design and implement components in operating system in C++.

CLO 7: Identify and formulate new operating system concepts like virtualization and multitenancy.

Recommended Texts

Title:	**Modern Operating Systems**, 4th edition
Author:	Andrew S. Tanenbaum and Herbert Bos
Publisher:	Pearson, 2014
ISBN:	978-0133591620
Title:	**Operating System Concepts**, 10th edition
Author:	Abraham Silberschatz, Greg Gagne, and Peter B. Galvin
Publisher:	Wiley 2018
ISBN:	978-1119456339
Title:	**Linux Command Line and Shell Scripting Bible**, 4th ed.
Author:	Richard Blum and Christine Bresnahan
Publisher:	Wiley 2021
ISBN:	978-1-119-70091-3
Online:	https://linuxconfig.org/bash-scripting-tutorial-for-beginners

Software to Install

Class examples will use the **Ubuntu** distribution of Linux and the **bash** shell (command language and interpreter). If you are on Windows 10, you will need to install Ubuntu. If you are on macOS, you do not need to install Ubuntu since macOS runs on a version of UNIX that is "close enough" to Linux. However, since Catalina, macOS uses **zsh** as its default shell. You should replace that shell with bash for this class.

Some useful tutorials:

- "Install Ubuntu on Windows 10"
  http://www.cs.sjsu.edu/~mak/tutorials/InstallUbuntuWindows.pdf
- "Install `bash` for macOS"
  http://www.cs.sjsu.edu/~mak/tutorials/InstallBashForMacOS.pdf
- "Configure Ubuntu for Software Development"
  http://www.cs.sjsu.edu/~mak/tutorials/ConfigureUbuntu.pdf

You should <u>not</u> need to install VirtualBox. But that is an alternate way to run Ubuntu on both Windows 10 and macOS:

- "Install Ubuntu on VirtualBox"
  http://www.cs.sjsu.edu/~mak/tutorials/InstallUbuntuVirtualBox.pdf

Course Requirements and Assignments

You should have good C programming skills and be familiar with software development tools such as Eclipse.

You will work during the semester in small teams. Programming assignments will provide experience using Ubuntu and bash.

Each team will submit its assignments and project into Canvas, which will display the scoring rubrics for grading. Each assignment and project will be worth up to 100 points. Late assignments will lose 20 points and an additional 20 points for each 24 hours after the due date.

The university's syllabus policies:

- University Syllabus Policy S16-9 at http://www.sjsu.edu/senate/docs/S16-9.pdf.

- Office of Graduate and Undergraduate Program's Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/

"Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus."

Technology Requirements

Students are required to have an electronic device (laptop, desktop, or tablet) with a camera and microphone. SJSU has a free equipment loan program available for students.

Students are responsible for ensuring that they have access to reliable Wi-Fi during tests. If students are unable to have reliable Wi-Fi, they must inform the instructor, as soon as possible or at the latest one week before the test date to determine an alternative. See Learn Anywhere website for current Wi-Fi options on campus.

Exams

The exams will test understanding (not memorization) of the material taught during the semester and now well each of you participated in your team assignments and project. Instant messaging, e-mails, texting, tweeting, file sharing, or any other forms of communication with anyone else during the exams will be strictly forbidden.

There can be no make-up and midterm examination unless there is a documented medical emergency. Make-up final examinations are available only under conditions dictated by University regulations.

Academic Integrity

"Major exams in this class may be video recorded to ensure academic integrity. The recordings will only be viewed if there is an issue to be addressed. Under no circumstances will the recordings be publicly released."

Grading Information

Individual total scores will be computed with these weights:

> 60% Assignments*
> 15% Midterm exam**
> 25% Final exam**
>
> *team scores*
> ** *individual scores*

Each assignment and exam will be scored (given points) but not assigned a letter grade. The average score of each assignment and exam will be available in Canvas after it has been graded.

Course grades will be based on a curve. Per CMPE Department policy, the median total score will earn a B–. Approximately one third of the class will earn higher grades, and another one third will earn lower grades.

Postmortem Report

At the end of the semester, each student must also turn in a short (under 1 page) individual postmortem report that includes:

- A brief description of what you learned in the course.
- An assessment of your accomplishments for your team assignments and design project.
- An assessment of each of your other project team members.

Only the instructor will see these reports. How your teammates evaluate you may affect your course grade.

Zoom Classroom Etiquette

- **Mute your microphone.** To help keep background noise to a minimum, make sure you mute your microphone when you are not speaking.
- **Be mindful of background noise and distractions.** Find a quiet place to "attend" class, to the greatest extent possible.
  - Avoid video setups where people may be walking behind you, people talking, making noise, etc.
  - Avoid activities that could create additional noise, such as shuffling papers, listening to music in the background, etc.
- **Position your camera properly.** Be sure your webcam is in a stable position and focused at eye level.
- **Limit your distractions and avoid multitasking.** You can make it easier to focus on the meeting by turning off notifications, closing or minimizing running apps, and putting your smartphone away (unless you are using it to access Zoom).
- **Use appropriate virtual backgrounds.** If using a virtual background, it should be appropriate and professional and should not suggest or include content that is objectively offensive and demeaning.

Recording Zoom Classes

This course or portions of this course (i.e., lectures, discussions, student presentations) will be recorded for instructional or educational purposes. The recordings will be posted to the class webpage. The recordings will be deleted at the end of the semester. **If you prefer to remain anonymous** during these recordings, then please communicate with the instructor about possible accommodations (e.g., temporarily turning off identifying information from the Zoom session, including student name and picture, prior to recording).

Students are Not Allowed to Record

Students are prohibited from recording class activities (including class lectures, office hours, advising sessions, etc.), distributing class recordings, or posting class recordings. Materials created by the instructor for the course (syllabi, lectures and lecture notes, presentations, etc.) are copyrighted by the instructor. This university policy ([S12-7](#)) is in place to protect the privacy of students in the course, as well as to maintain academic integrity through reducing the instances of cheating. Students who record, distribute, or post these materials will be referred to the Student Conduct and Ethical Development office. Unauthorized recording may violate university and state law. It is the responsibility of students that require special accommodations or assistive technology due to a disability to notify the instructor.

Proctoring Software and Exams

Exams will be proctored in this course through Respondus Monitor, LockDown Browser, and Zoom video meeting. Please note it is the instructor's discretion to determine the method of proctoring. If cheating is suspected the proctored videos may be used for further inspection and may become part of the student's disciplinary record. Note that the proctoring software does not determine whether academic misconduct occurred but does determine whether something irregular occurred that may require further investigation. Students are encouraged to contact the instructor if unexpected interruptions (from a parent or roommate, for example) occur during an exam. Please refer to the online exam instructions for details of the setup and requirements.

Technical Difficulties

- **Internet connection issues:** Canvas autosaves responses a few times per minute as long as there is an internet connection. If your internet connection is lost, Canvas will warn you but allow you to continue working on your exam. A brief loss of internet connection is unlikely to cause you to lose your work. However, a longer loss of connectivity or weak/unstable connection may jeopardize your exam.
- **Other technical difficulties:** Immediately notify the instructor and explain the problem you are facing. Your instructor may not be able to respond immediately or provide technical support. However, the current state of your exam and communication will provide a record of the situation.

Contact the SJSU technical support for Canvas:

> Technical Support for Canvas
> Email: ecampus@sjsu.edu
> Phone: (408) 924-2337
> https://www.sjsu.edu/ecampus/support/

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Program's [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at http://www.sjsu.edu/gup/syllabusinfo/.

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Course Schedule (subject to change with fair notice)

Week	Dates	Topics
1	Jan 29	Introduction UNIX and Linux The **bash** command shell *Create project teams*
2	Feb 5	Operating system concepts POSIX system calls Operating system structure
3	Feb 12	Processes and threads
4	Feb 19	Processes and threads
5	Feb 26	Processes and threads
6	Mar 5	Deadlocks Memory management
7	Mar 12	Memory management
8	Mar 19	Memory management
9	Mar 26	*Midterm* Operating system design
	Mar 29 – Apr 2	*Spring break*
10	Apr 9	Storage and file management
11	Apr 16	Storage and file management
12	Apr 23	I/O management
13	Apr 30	Virtual systems Multiprocessor operating systems Distributed operating systems
14	May 7	Security
15	May 14	Case study: Windows Case study: Android
Final exam	*Thursday May 20*	Time: 9:45 AM – 12 noon Zoom