SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

Operating Systems Section 01 CS 149

Spring 2023 3 Unit(s) 01/25/2023 to 05/15/2023 Modified 04/04/2023

Contact Information

Instructor: Dr. Faramarz Mortezaie

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Office Hours

Thursday at 4:00 PM to 5:00 PM
https://sjsu.zoom.us/j/87161337092

Office hour Zoom Link:
https://sjsu.zoom.us/j/87161337092

Course Description and Requisites

Fundamentals: Contiguous and non-contiguous memory management; processor scheduling and interrupts; concurrent, mutually exclusive, synchronized and deadlocked processes; parallel computing; files. Substantial programming project required.

Prerequisite(s): CS 47 or CMPE 102 (with a grade of Â¿C-Â¿ or better), and CS 146 (with a grade of Â¿C-Â¿ or better). Allowed Declared Majors: Computer Science, Applied and Computational Math, Forensic Science: Digital Evidence, or Software Engineering Majors only; or Instructor Consent.

Letter Graded

Classroom Protocols

Attendance

Students are expected to attend all the lectures.

Use of Camera in Class

Using camera during lecture is optional. But during the exams and weekly quizzes, you must turn on your webcam. If you there are any issues, please let me know in advance.

Recording of Zoom Classes

It is strongly recommended that you attend all the zoom meetings. Just in case you cannot attend a zoom lecture, zoom lectures will be recorded and recordings will be posted on Canvas. If there are technical issues with zoom recordings, the topics discussed will be posted.

Students are not allowed to record without instructor permission

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, aswell 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 and LockDown Browser. 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 occur during an exam.

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 email the instructor a current copy of the state of your exam and explain the problem you are facing. Your instructor may not be able to respond immediately or provide technical support. However, the copy of your exam and email 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/

If possible, complete your exam in the remaining allotted time, offline if necessary. Email your exam to your instructor within the allotted time or soon after.

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/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 or demeaning.

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Goals

Course Learning Outcomes (CLOs)

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

- Understand the role that the operating system software plays in the management of the various hardware subsystems of the computer system.
- Understand locality of memory reference and how it is used to perform effective memory hierarchy management.
- Understand the various mapping, replacement, and dynamic allocation algorithms for cache and virtual memory management.
- Understand the alternative CPU scheduling schemes, their tradeoffs, and their applications to other queue processing situations.
- Appreciate the difficult tradeoffs faced when attempting to deal with the resource deadlock problem and distinguish between the different deadlock prevention and avoidance schemes and understand why and how deadlocks can still happen today.
- Understand software race conditions, their origin and the problems they can cause, along with knowing how to apply semaphores in software design to solve the race condition problem.
- Understand the various issues associated with the operating system's role in performing I/O and file management.

Course Materials

Required Texts/Readings Textbook

Silberschatz, P. Galvin, and G. Gagne,Operating System Concepts,10/E. Wiley, April 2018.

ISBN-13:9781119127482.

Other Readings

2018. Stallings, Operating Systems: Internals and Design Principles, 9/E. Pearson, 2018.

ISBN-13: 9780134670959.

Course Requirements and Assignments

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty- five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at http://www.sjsu.edu/senate/docs/S12-3.pdf.

Homework, Midterm and Final exam are expected for this class. Each assigned problem requires a solution and an explanation (or work) detailing how you arrived at your solution. Cite any outside sources used to solve a problem. When grading an assignment, I may ask for additional information.

NOTE that University policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states that “Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class.

Attendance per se shall not be used as a criterion for grading.”

Grading Information

Homework, Weekly Quiz, discussion and project	25%

Exam-1	25%
Exam-2	25%
Comprehensive Final Exam	25%

The final and exams have fixed dates and can only be taken in the classroom during class time. Makeup exams will only be given in cases of illness (with signed documentation from a medical facility – original copy).

Exams are closed book, closed notes, closed neighbor and comprehensive. The final exam is cumulative.

Late work policy: No late assignment will be accepted.

Note that "All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades." See University Policy F13-1 at http://www.sjsu.edu/senate/docs/F13-1.pdf for more details.

University Policies

Per University Policy S16-9 (http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on Syllabus Information web page (https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (https://www.sjsu.edu/curriculum/courses/syllabus-info.php). Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

Week-1: The Role of OS, Resource Management, Review of C language

Week-2: User and Operating System Interfaces, System Calls – Linux and shell programming

Week-3: Inter process Communication, Inter process Communication

Week-4: Process Scheduling, Inter process Communication

Week-5: Threads and Concurrency, Multithreading

Week-6: Review, Exam-1 (Using Lockdown Browser)

Week-7: CPU Scheduling, Multi-process Scheduling

Week-8: Race Conditions – Critical section problem, Semaphores

Week-9: Monitors – signal and wait, Synchronization in Java

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Week-10: Monitors – signal and wait, Synchronization in Java

Week-11: Deadlock characterization, Deadlock in Multithreaded Applications

Week-12: Review, Exam-2

Week-13: Contiguous Memory Allocation, Paging and TLB

Week-14: Virtual Memory

Week-15: File System

Week16: Final Exam