ECE 3352 --- Operating System Design

Fall 2024

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Texts: Operating System Concepts Essentials (2nd Edition)
by Abraham Silberschatz, Peter Galvin, and Greg Gagne
TCP/IP Sockets in C (2nd Edition)
Michael Donahoo and Kenneth Calvert

Optional Reference Texts:
The C Programming Language by Brian Kernighan and Dennis Ritchie
UNIX Systems Programming: Communication, Concurrency and Threads
by Kay Robbins and Steven Robbins

Course Description: Design and implementation of single and multiuser operating systems. Topics include OS structure, process management, interprocess communication within and between CPUs, memory management, file systems, and I/O. Contemporary operating systems provide design examples.

Prerequisite: *ECE 2300 Software Design I* and *ECE 2304/2104 Microprocessor Systems I* (C or better)

Class Hours: Tuesdays and Thursdays 3:00PM to 4:20PM (CRBL C203)

Office Hours: Tuesdays and Thursdays 11:30AM to 1PM (ENG A340)

Course Outline:

Week 1:	Introduction (Chap. 1)
Weeks 1-2:	Operating Systems Structures (Chap. 2)
Week 3:	Introduction to Processes/Threads (Chaps. 3 and 4)
Weeks 4-5:	Process Scheduling (Chap. 6)
Weeks 6-7:	Process Synchronization (Critical Section Problem) (Chap. 5)
Weeks 7-8:	Deadlocks: Characterization and Prevention (Chap. 5)
Week 8:	**Midterm Exam**
Week 9:	Network Communication (Intro to Socket Programming) (Textbook 2)
Weeks 10-12:	Memory Management (Chaps. 7 and 8)
Weeks 12-13:	File Systems (Chaps. 9 to 11)
Weeks 14-15:	Input/Output Systems (incl. Device Drivers) (Chap. 12)

Grading:

Homework/Quizzes	25%
Prog. Assignments	25%
Midterm	25%
Final	25%

Learning Objectives: [correlation to IEEE/ACM CE2016 curriculum standard and ABET outcomes in square brackets]

1. Overview of operating system history and definition of operating systems [***CE-SRM-1***]
2. Common set of services provided by an operating system [***CE-SRM-2***]
    a. user interfaces
    b. programming interfaces
3. Process/Thread Management [***CE-SRM-3, CE-SRM-4, ABET 1c (P)***]
    a. Definition of Processes/Threads
    b. Basic process/thread management
    c. Process/thread scheduling, including real-time scheduling
    d. Scheduling theory
    e. Race conditions
    f. Process/thread synchronization
    g. Deadlocks
4. Multi-threaded programming and Multi-core processors [***CE-CAO-10/11, CE-SRM-6***]
    a. POSIX pthreads library
5. Network Communication [***ABET 1c (P), 2a (D), and 2b (D)***]
    a. socket programming
6. Memory Management [***CE-SRM-3, ABET 1a (D) and 1c (P)***]
    a. Hierarchical memory design
    b. Virtual memory
    c. Memory sharing and allocation
    d. Paging and page replacement algorithms
    e. Frame allocation to avoid thrashing
7. File Systems [***CE-SRM-3***]
    a. File and directory abstractions
    b. Storage allocation methods
    c. Disk scheduling
8. I/O Systems [***CE-SRM-3, CE-CAO-9, ABET 1c (P), 2a (D), and 2b (D)***]
    a. Characteristics of I/O devices (byte/block, sequential/random, synchronous/asynchronous, polling/interrupts)
    b. Memory-mapped device registers
    c. Device driver design (hardware abstraction layer); blocking, non-blocking, and asynchronous models

Academic Honesty

During exams and quizzes, you are not allowed to use any form of WiFi enabled electronic device, including cell phones or other electronic communication devices or methods (wrist watches, earbuds, etc.). No wrist watch or other electronic device may be worn.

No electronic version of the book, loose paper print-outs of the book or extra sheets of paper of any kind are allowed unless explicitly mentioned in writing by the instructor. As a part of the zero-tolerance policy, if you have a cellphone or other electronic device capable of communication on your person; or if any proctor sees or hears any electronic device during the exam or if you share your work with someone else, you will be reported to the proper authorities and you may receive a zero on the exam and an F in the class. Other actions including suspension may also be pursued.

If anyone leaves the exam room during an exam they must be accompanied by a proctor. This includes restroom breaks.

University approved recording devices may also be located at various locations in the room and may be out of sight of the students. These recordings will be managed according to the UTEP approved regulations for such media.

If you are suspected of scholastic dishonesty you may not be directly confronted about your conduct by the instructor or proctor. You will however, be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) and your exam will not be admissible. Your grade in the class may not be available until OSCCR makes a final ruling, this may adversely impact your ability to enroll in other classes.

There will be no makeup exams administered. If you have a university approved excuse, your instructor will have a process for determining how to handle the missing grade outlined in the syllabus. However, no makeup exams will be given.

If you miss more than one exam, the instructor may choose to administratively drop you from the class. This may adversely impact a visa and financial aid.

Any food or drink brought into the examination room is subject to careful inspection by a proctor.

Departmental policy allows for the use of assigned seats. All students must present their UTEP issued ID prior to and during every exam and may be required to sign in. Not having a UTEP issued ID when asked will result in forfeiture of the exam.

Scholastic dishonesty on homework, lab assignments and all other class assignments will be held to the same standards and requirements of academic honesty as quizzes and exams.

Class Attendance Policy

Attendance is mandatory. Anyone with 5 or more absences will be dropped from the class. A drop for not attending will count toward the State Allowed Six Drop Limit. If you are failing the class at the time of the drop you may also be given a WF designation. Be advised that a drop could adversely impact visa status, financial aid and other programs.

As per UTEP rules, you may be asked to show a UTEP ID at any time during class. Anyone who is present and not registered in the class will be subject to disciplinary action unless the instructor gives prior approval.

Excused Absence for Exams

The UTEP catalog allows Exam Absence to be excused ONLY for University-Recognized Activities and very specific other situations. Medical absence is NOT allowed in the UTEP catalog. For consistency with the catalog, students will NOT be excused from exams due to illness.

Harassment Policy

The department has a zero-tolerance policy for harassment. Engagement in any behavior considered harassment will be reported to the proper authorities. In addition to generally understood forms of harassment, the department also treats the following behavior as harassment:

· Repeated emails and/or calls regarding subjects that have already been addressed. Once a decision has been made or a question answered, a student who continues to ask the same question will be given a warning by the recipient of the email/call. If the student continues, the behavior will be reported. Questions that seek understanding of course material are not harassment; but repeated questions about a grade or an administrative decision are.

· Grades are NOT negotiable, ever. You receive the grade you earned, not the grade you want or even desperately need. If you believe a grading mistake has been made, you must follow the process described in the UTEP catalog. Any request for a grade elevation that is NOT based on a mistake is considered harassment and will be reported immediately.

· Remaining in an office after the occupant requests you leave is considered harassment and potentially threatening. You will be reported immediately without warning and depending on the severity, may be reported to law enforcement.

· Similar behavior towards department staff, and student advisors will also be treated as harassment, including persistent phone calls, emails, and badgering. Department staff and student advisors are there to help students, and should be treated with due respect.

If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass. *CASS' Staff are the only individuals who can validate and if need be, authorize accommodations for students with disabilities.*