

**Texas Tech University  
Department of Computer Science**

**Course Name: Advanced Operating Systems Design Number: CS 5352-001/-D01 Semester: \_Spring 2021\_**

**Instructor Name: \_Yong Chen\_ Office: \_On Microsoft Teams \_ e-mail: \_yong.chen@ttu.edu\_**

**Instructor's Office Hour: 1 – 2 pm. on Tue. and Thur.**

**TA Name: \_\_\_\_\_TBA\_\_\_\_\_ Office: \_\_TBA e-mail: \_\_TBA**

**TA Office Hours: TBA**

**Given the COVID-19 pandemic, this course will be entirely online and delivered via Zoom. Below please find the lecture meeting link. If you write me an email for this class, please start the email subject with [CS5352].**

<https://zoom.us/j/92031282760?pwd=NVRlQUUpOjc2RqNjNtV2VSMEFnUDdiUT09>

Meeting ID: 920 3128 2760

Passcode: 114114

**Texts:** “Modern Operating Systems”, by Andrew S. Tanenbaum, Edition: 4th, ISBN: ISBN-10: 013359162X; ISBN-13: 978-0133591620, Publisher: Prentice Hall

**Course objectives:**

The objective of this course is to introduce various elements involved in the design and implementation of operating systems.

**Key Topics:**

Operating systems structure; Operating systems design and implementation; Processes and threads; File systems; Device management; Paging and virtual memory; Security

**Expected Prior Knowledge and Skills In:** \_data structures, computer architectures, algorithms, C programming

**Ethical Conduct:** Students are expected to comply with the Texas Tech Code of Student Conduct in all aspects of this class. The Code of Student Conduct may be found from the Student Handbook and/or Office of Student Conduct.

In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from engaging in any other form of distraction, such as reading newspapers, working on other classes, taking cell phone calls, text messaging, and working on laptop computers. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class.

Violations of conduct including academic dishonesty, foul language, and classroom citizenship are eligible to be reported to Student Judicial Services.

**Grading Policy:** All submissions are graded according to the assignment guidelines, course policies, verbal instructions/explanations and materials given in class lectures.

- Written assignments – 25% (five written assignments, weighing 5% each)
- Programming projects – 30% (three programming projects, weighing 10% each)
- Exams – 30% (two exams, weighing 15% each)
- Research-oriented course project – 15% (presentation and deliverables)

Course letter grade assignments: A=[90, 100], B=[80, 90), C=[70, 80), D=[60, 70), F=[0, 60)

**Student with Disabilities:** The university is committed to the principle that in no aspect of its programs, shall there be differences in the treatment of persons because of race, creed, national origin, age, sex, or disability and that equal opportunity and access to facilities shall be available to all. If you require special accommodations in order to participate, please contact the instructor during office hours or by e-mail [yong.chen@ttu.edu](mailto:yong.chen@ttu.edu). Students should present appropriate verification from Student Disability Services. No requirement exists that accommodations be made prior to completion of this approved university process.

## Course Schedule

Week	Topic (sections)
W1	Syllabus highlights, roles and history of operating systems (1.1-1.2)
W2	Computer hardware review and operating system concepts (1.3-1.5) Shell programming and system programming (additional materials)
W3	System calls and operating system structure (1.6-1.8) Processes, implementation, and thread model (2.1-2.2, additional materials)
W4	Thread implementation and interprocess communication (2.2-2.3) Semaphores, mutexes, and scheduling (2.3-2.4)
W5	Scheduling and classical IPC problems (2.4-2.5) Memory abstraction and virtual memory (3.1-3.3)
W6	Page replacement algorithms (3.4, additional materials) Paging systems and implementation (3.5-3.6)
W7	Segmentation (3.7) Files and directories (4.1-4.2)
W8	Midterm review and assignment discussions Midterm exam
W9	File system implementation (4.3, additional materials) Midterm exam discussion
W10	File system management and optimization (4.4) Example file systems (4.5), Principles of I/O hardware and software (5.1-5.2)
W11	Programming project discussions I/O software layers, disk structure, storage-class memory (5.3-5.4, additional materials)
W12	Disk scheduling, clocks, clock synchronization (5.4-5.5, additional materials) User interfaces and power management (5.6-5.8), Networking (additional materials)
W13	Communication protocols, sockets, remote procedure call (additional materials) Security and basics of cryptography (9.1-9.5)
W14	Authentication, attacks, and defenses (9.6-9.10) CS5352 students course project presentations
W15	CS5352 students course project presentations Review and assignment discussions, open discussions
5/6	Final exam

Written Assignments	Date Assigned	Date Due
1 Chapter 1	2/2	2/9
2 Chapter 2	2/16	2/23
3 Chapter 3	3/2	3/9
4 Chapter 4	3/25	4/1
5 Chapter 5 and 9	4/20	4/27

Programming Projects	Assigned	Due
1 Shell programming, process and multithreading on Linux	2/9	2/23
2 Producer-consumer problem with PThreads	2/23	3/16
3 File system utility on Linux	3/25	4/15

Research-oriented course project: presentations are tentatively scheduled on 4/22 and 4/27 during class time and final deliverables are due on 5/4.

Exams (1-hour, open-book exam; must take at the specified time)

- 1 Midterm exam tentatively on 3/11, 2 p.m. – 3 p.m., online, covering chapter 1, chapter 2, and chapter 3
- 2 Final exam on 5/6, 5 p.m. – 6 p.m., online, covering chapter 4, chapter 5, and chapter 9

**Topics and/or dates may be changed during the semester at the instructor's discretion because of scheduling issues, developments in the discipline, or other contingencies.**

**Computer Usage:** A Linux server will be provided for Linux programming, testing, and hands-on experience. Personal computers or the on-campus computer labs should be used for accessing the Linux server remotely for programming assignments. Detailed information regarding the access will be announced later.