

COSC 40203 - Operating Systems

Dr. Michael Scherger

Spring 2016

Instructor Contact Information

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Course Information

- Meeting Time: M, W: 12:30-13:50
- Classroom: Tucker Technology Center - 352
- Webpage: Pearson Learning Studio and <http://personal.tcu.edu/mscherger>
- Final Exam: 11:30 - 14:00, Monday, May 2, 2016

Course Description

Introduction to operating systems concepts, principles, and design. Topics include: processes and threads, CPU scheduling, mutual exclusion and synchronization, deadlock, memory management, file systems, security and protection, networking, and distributed systems. Selected existing operating systems are discussed, compared, and contrasted.

Textbook and Readings

- [1] Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne. *Operating System Concepts*. John Wiley, 9th edition, 2012.

Prerequisites

Successful completion of Computer Organization (COSC 30253) and Discrete Math II (MATH 30123).

Course Objectives

Upon completion of this course, students will be able to ...

1. Recognize and explain the functionality operating systems provide, basic operations and services.
2. Understand the design of various operating systems, system calls, kernel and user modes, operating system structures, virtual machines, and the system boot process.
3. Describe the concept of a process, process scheduling and inter-process communication.
4. Discuss the concept of a thread, multi-threading models and libraries.
5. Comprehend and analyze the concepts of CPU scheduling, scheduling criteria, and scheduling algorithms.

6. Compare and evaluate various aspects of process synchronization including the critical section problem, Peterson's solution, synchronization hardware, and semaphores. Classic synchronization problems will also be explored.
7. Analyze the system model and characteristics of deadlocks and methods of handling deadlocks (prevention, avoidance, detection, recovery).
8. Describe, illustrate, and distinguish the structures for main memory including swapping, paging, and segmentation.
9. Describe, illustrate, and distinguish the structures for virtual memory including demand paging, page replacement algorithms, frame allocation, and thrashing.
10. Recall the concepts related to the file system interface and file system implementation including free space management, efficiency and performance.
11. Recall and differentiate the concepts related to mass storage structures such as disk structure, attachment, and scheduling and including the various RAID architectures.
12. Explain and analyze algorithms for distributed operating systems such as distributed coordination, election algorithms, and distributed mutual exclusion.

Course Schedule and Topics (Subject to change)

Week #	Topic	Readings
Week 1	Introduction, Operating System Structures	Ch. 1, 2
Week 2	MLK Day - No classes on Monday, Operating System Structures, Shells	Ch. 2, Notes on Shells
Week 3	Processes and Process Communication	Ch. 3
Week 4	Threads and pthreads	Ch. 4
Week 5	TBA and Exam1	
Week 6	Process Synchronization	Ch. 5
Week 7	CPU Scheduling	Ch. 6
Week 8	Deadlock	Ch. 7
Week 9	Spring Break	
Week 10	TBA, Exam 2	
Week 11	Main Memory	Ch. 8
Week 12	Virtual Memory	Ch. 9
Week 13	Distributed Systems	Ch. 17 and Notes
Week 14	Distributed Systems, File I/O Systems	Ch. 17 (selected sections), Notes on Dist. Sys., Ch. 10, 11 (selected sections)
Week 15	File I/O Systems, Protection and Security	Ch. 11, 12 (selected sections), Ch. 14, 15 (selected sections)
Week 16	Protection and Security	Ch. 14, 15 (selected sections)

Course Assessments, Extra Credit, and Late Work Policies

UPDATED

- **55% Homework and Programming Projects:** There will be weekly assigned homework. Students will be required to write answers to homework assignments using L^AT_EX. There will be 5-6 programming projects. These projects will reinforce material covered in lecture. Students will have approximately 2-3 weeks to complete each programming assignment. Students will be required to submit assignments via the appropriate dropbox created in Pearson Learning Studio. Note: homework assignments and programming projects will overlap.
- **45% Exams:** There will be three exams on approximately the 5th, 10th, and finals week.
- **Extra Credit:** Homework assignments may have extra credit problems. Extra credit problems are made available to the whole class and not an individual student. Extra credit problems are optional.
- **Late Work:** Late homework assignments are accepted with a penalty of 10% per calendar day. Students are provided with 5 "late day coupons" that can be used on any homework or project assignment. You may use your late day coupon to turn in a homework or project assignment late; 1 coupon = one late day. Late day coupons are not transferable to any other student, can only be used for homework or project assignments in this course, and have no monetary value. Multiple coupons can be used with one late homework or project assignment. If the homework or project is a group assignment, then each member of the group must turn in the same number of late day coupons for each late day.

Grading Scale

Final course grades are rounded to the nearest integer.

≥93	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	<60
A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

Make-up Work

Make-up work will only be permitted for two reasons: an official university absence or documented medical appointments. A student who has an *official university absence* must contact the instructor *before* the absence to schedule a make up of any assessment that will be missed. A student who has a *documented medical appointment* will need to bring in documentation of medical excuse in order to makeup the work. Such medical related absences will be rescheduled accordingly.

Mobile Device / Laptop Computer Usage

Please turn off cell phones and other related electronic devices. Disruptions caused by cell phones and other related devices may result in a pop quiz for the entire class. You may use your computer to follow along with the slides presented and take notes. Please refrain from using social media sites until after class.

Attendance Policy

Due to the nature of this course, this class will require that your body and mind show up to every class. In addition to simply being in class, you should come prepared to ask questions about the material being covered that day.

TCU Campus Resources for Students

****TCU Campus Resources for Students:** Many resources exist on the TCU campus that may be helpful to students: Mary Coats Burnett Library (257-7117); Center for Academic Services (257-

7486, Sadler Hall. 1022); the William L. Adams Writing Center (257-7221, Reed Hall 419); Student Development Services (257-7855, BLUU 2003); and Office of Religious & Spiritual Life (257-7830, Jarvis Hall), Campus Life (257-7926, Sadler Hall 2006), and the Counseling, Testing, and Mental Health Center (257-7863, Brown Lupton Health Center).

***Email Notification:** Only the official TCU student email address will be used for all course notification. It is your responsibility to check your TCU email on a regular basis.

Academic Dishonesty

The Computer Science Department takes academic dishonesty quite seriously. Academic misconduct will not be tolerated. Such acts are detailed in the current TCU Academic Catalog and include: copying, using, or in any way misrepresenting another's work as your own; substituting for another or having someone substitute for you; plagiarism; collusion; abusing resource materials; unauthorized use of computer software or hardware; fabrication and falsification; complicity in misconduct. Such conduct at a minimum results in a zero on the test or assignment, and may result in a failing grade for the course.

Unless otherwise stated on the assignment sheet, all graded material must be completed individually. Students may give each other general advice, but they may not share algorithms, final answers, or program source code.

Finally, you should be careful not to give others access to your code. This means that you should not keep your program in a publicly accessible directory, you should not leave your terminal unattended, and you should not forget to pick up your printouts.

Netiquette: Communication Courtesy Code

All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. If I deem any of them to be inappropriate or offensive, I will forward the message to the Chair of the department and the online administrators and appropriate action will be taken, not excluding expulsion from the course. The same rules apply online as they do in person. Be respectful of other students. Foul discourse will not be tolerated. Please take a moment and read the following link concerning netiquette <http://www.albion.com/netiquette/>. Participating in the virtual realm, including social media sites and shared-access sites sometimes used for educational collaborations, should be done with honor and integrity:

Student Disabilities Statement

Texas Christian University complies with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973 regarding students with disabilities. Eligible students seeking accommodations should contact the Coordinator of Student Disabilities Services in the Center for Academic Services located in Sadler Hall, 1010. Accommodations are not retroactive, therefore, students should contact the Coordinator as soon as possible in the term for which they are seeking accommodations. Further information can be obtained from the Center for Academic Services, TCU Box 297710, Fort Worth, TX 76129, or at (817) 257-6567.

Adequate time must be allowed to arrange accommodations and accommodations are not retroactive; therefore, students should contact the Coordinator as soon as possible in the academic term for which they are seeking accommodations. *Each eligible student is responsible for presenting relevant, verifiable, professional documentation and/or assessment reports to the Coordinator.* Guidelines for

documentation may be found at http://www.acs.tcu.edu/disability_documentation.asp.

Students with emergency medical information or needing special arrangements in case a building must be evacuated should discuss this information with their instructor/professor as soon as possible.

TCU Mission Statement

To educate individuals to think and act as ethical leaders and responsible citizens in the global community.

Course syllabi are intended to provide students with basic information concerning the course. The syllabus can be viewed as a blueprint for the course; changes in the syllabus can be made and students will be informed of any substantive changes concerning examination, the grading or attendance policies and changes in project assignments.