CSci 530 Operating Systems

Course Syllabus

Summer 2015

Instructor

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Class Meetings

This is an online, web based course. All lectures, course materials, assignments and tests will be distributed through our University's eCollege online course system. Student's are responsible for ensuring they have access to eCollege during the course and that they have adequate resources and network access to obtain and use the materials online through eCollege.

This online summer class is what is known as a W10 based course. It will meet for 10 weeks over both the summer I and II sessions, from June 8, 2015 through August 13, 2015.

01W 40412 Meets 6/8/2015 through 8/13/2015 Web Based Class

Course Objectives

The course objectives are two fold:

- To learn the general theory, concepts and techniques related to the design of modern general purpose operating systems.
- To practice the design of an operating system by performing programming exercises of various OS components and principles.

Course Description

General theory and concepts behind operating system design and implementations are discussed in this course. Topics include operating system structures, memory management, process scheduling, process synchronization and communication, concurrency issues, deadlocks, and case studies of other commercially available operating systems. **Credit hours: 3**.

Prerequisites

CSCI515 Fundamentals of Programming C/C++; and CSCI516 Fundamental Concepts of Computing and Machine Organization.

Student Learning Outcomes:

- (SLO530.1) Student will be able to analyze the major elements and relationships between them of fundamental general purpose operating systems, including memory, CPU, the system bus and I/O devices.
- (SLO530.2) Students will be able to compare the trade offs and effects of differing memory management techniques such as paged and segmented memory, and will be able to demonstrate the advantages and uses of virtual memory in particular.
- (SLO530.3) Students will be able to produce and understand software simulations of fundamental OS components, such as memory management and page replacement, process selection, and process state transition management for multiprogramming.
- (SLO530.4) Student's will be able to analyse and understand issues with concurrent and parallel exection of program threads, including concepts such as mutual exclusion, starvation, deadlocks and race conditions
- (SLO530.5) Students will be able to analyze concurrent algorithms for deadlock avoidance, detection and management of concurrent processes using mutual exclusion mechanisms.
- (SLO530.6) Student's will be able to evaluate and judge the advantages and disadvantages of process scheduling algorithms, and be able to implement and understand simple process scheduling procedures.
- (SLO530.7) Student's will understand fundamental concepts related to the organization, management and scheduling of I/O systems, including major file system concepts and structures such as B-Trees.

Textbooks

Required:

Operating Systems Internals and Design Principles (2011). 7^{th} Edition. by William Stallings, Prentice-Hall Inc., 2011, ISBN-10:013230998X.

Recommended:

Operating System Concepts (2006). 7^{th} Edition. by A. Silberschatz and P. Galvin, John Wiley & Sons, Inc., ISBN 0-471-69466-5.

Topics

The graduate operating systems course will be broken up into five parts. Each part will have assignments and tests covering the materials and concepts for that section of the course.

Part One	Background, Processes and Threads
	Ch 1: Computer System Overview
	Ch 2: Operating System Concepts
	Ch 3: Processes
	Ch 4: Threads
Part Two	Concurrency
	Ch 5: Mutual Exclusion and Synchronization
	Ch 6: Deadlocks, Avoidance and Prevention
Part Three	Memory
	Ch 7: Memory Management Concepts
	Ch 8: Virtual Memory
Part Four	Scheduling
	Ch 9: Scheduling Algorithms
	Ch 10: Multiprocessor and Real-Time Scheduling
Part Five	Input/Output and Files
	Ch 11: I/O Management and Disk Scheduling
	Ch 12: File Management

Evaluation (Tentative)

Your grade for the course will be based on the following (approximate) percentages.

Exams (5)	50% (10% each)
Programming Assignments (5)	25% (5% each)
Written Problem Sets (5)	20% (4% each)
Class Participation	5%

Final letter grades for the course will be assigned based on your overall class average, according to the following breakdown:

Final Average	Letter Grade
90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
Below 60	F

Course Requirements

For a normal 16 week course, we usually recommend you plan for at least 12 hours of study time per week for a 3 credit hour course (which will vary depending on your background and ability). We cover the same material in summer as in a regular semester, but in less than 2/3 of the total time. Thus a rough guidelines of 18 to 20 hours a week allocated for reading, studying and performing assignments should be expected for students with a required background for the course materials.

Assignments: There will be regularly assigned written problem sets and programming assignments. Assignments will be given and returned via the online eCollege system as a convenience to the students and the instructor. In general, we will have 1 written assignment and/or 1 programming assignment for each of the major parts of the course. All programming assignments are required to be done in the C/C++ programming language for this course. Guidelines for program style and formatting will be provided and will make up a portion of each programming assignment grade. It is very important

that students follow the instructions carefully on the assignments. It is the student's responsibility to have all assignments ready on time by the given due date. Late assignment may not be accepted or may be penalized and assignment may not be accepted beyond a certain time. Important material from the text and outside sources will be covered in class. Students should plan to take careful notes as not all material can be found in the texts or readings. Discussion is encouraged as student-procured outside material relevant to topics being covered. End of chapter activities and online activities may be assigned to reinforce material in the text.

Exams: Five exams will be given, one for each of the major sections of the course. The exams will not be comprehensive, and will focus on the particular materials/readings just covered in the previous 2 to 3 weeks of the course. The instructor may add other exams as they see necessary.

Quizzes: Unannounced pop-quizzes may be given in class and/or online through eCollege to help ensure students stay up with assigned material.

Class Participation: Weekly discussion questions will be posted on eCollege. Students will have a chance to discuss the concepts raised in the course materials, and interact with one another to help improve each others understanding of the concepts.

Course Deadlines

Credit will be given for ONLY those exam(s), program(s), and/or project(s) turned in no later than the deadline(s) as announced by the instructor of this class unless prior arrangement has been made with the instructor.

Attendance Policy

Students are expected to follow all instructions and visit eCollege regularly many times weekly to complete the materials for this online course. If a student is unable to submit assignments by the due date for the assignment, they are expected to make alternative arrangements to assure that the assignment is turned in ON TIME, before the assignment is actually due. Any student wishing to withdraw from the course must do so officially as outlined in the class schedule. THE INSTRUCTOR CANNOT DROP OR WITHDRAW ANY STUDENT.

Academic Ethics

"All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment." (See Student's Guide Handbook, Policies and Procedures, Conduct). Ethics also includes the issue of plagiarism, and copying code for programming assignments is just as serious as any other type of plagiarism. If you are caught sharing or using other people's work in this class, you will receive a 0 grade and a warning on the first instance. A subsequent instance will result in receiving an F grade for the course, and possible disciplinary proceedings.

Student's with Disabilities

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact: Office of Student Disability Resources and Services, Texas A&M University-Commerce, Gee Library, Room 132, Phone (903) 886-5150, StudentDisabilityServices@tamuc.edu

Course Schedule (Preliminary)

W	Dte	Topic / Activity	Test
		Part One: Background, Processes and Threads	
1	6/8	Computer and OS Overview (Ch. 1, 2)	
2	6/15	Process description and control, Threads (Ch. 3, 4)	6/18
		Part Two: Concurrency	
3	6/22	Concurrency I: Mutual exclusion (Ch. 5)	
4	6/29	Concurrency II: Deadlock/Starvation (Ch. 6)	7/2
		Part Three: Memory Management	
5	7/6	Introduction to Memory Management (Ch. 7)	
6	7/13	Virtual Memory (Ch. 8)	7/16
		Part Four: Scheduling	
7	7/20	Introduction to Process Scheduling (Ch. 9)	
8	7/27	Multiprocessor Scheduling (Ch. 10)	7/30
		Part Five: Input/Output and Files	
9	8/3	I/O Management and Disk Scheduling (Ch. 11)	
10	8/10	File Management (Ch. 12)	8/13