CSI 4500 Operating Systems, Winter 2018

General Information

Instructor: Guangzhi Qu
Office Location: 538 Engineering Center
Office Hours: T/Th 9:00-10:00am or by appointment
Phone: (248) 370-2690
Fax: (248) 370-4625
Email: gqu at oakland dot edu (please put CSI 4500 in the subject line)
Teaching Assistant: Zijun Han (zhan@oakland.edu)

Lectures: T/Th 1:00pm - 2:47pm
Class room: EC 279

Course Information

Prerequisites

- CSE 364 (Computer Organization), and
- CSE 361 (Design and Analysis of Algorithms)

Course Description

This course will introduce the concepts and design of multi-programming operating systems. The operating system provides a convenient and efficient interface between user programs and the bare hardware of the computer on which they run. The operating system is responsible for resources (e.g., CPU, memory, I/O, disks, and networks) sharing, providing common services needed by many different programs (e.g., access to I/O devices, the ability to start/stop a process), and protecting an individual program from interfering with one another. Particular emphasis will be given to three crucial OS components: process, memory, and file system management.

Course Objectives

Upon completion of the course, students will be able to:

- Describe concepts and functions of operating systems (j).
- Describe OS process management concepts (b, j).
- Demonstrate understanding of different CPU scheduling algorithms (a, b).
- Describe concepts of memory management (a, b).
- Describe concepts of file systems (j).

Text [Strongly Recommended]

Operating Systems Concepts, 9th Ed., by Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, John Wiley Sons, 2008 (Comment: 7th , 8th Ed. will also work, but you may need to search for the content.) ISBN 978-0-470-12872-5

Course Website: All course information (lecture notes, projects, announcements, questions, etc.) will be posted in Moodle (https://moodle.oakland.edu/). Students are responsible for checking Moodle on a regular basis. **Note**: Firefox is the preferred browser for Moodle. A free download is available at http://www.mozilla.com/firefox/

Topics Covered

- Operating System overview (chapters 1,2)
- Process management (chapter 3), Threads (chapter 4), Process Synchronization (chapter 6), and Deadlocks (chapter 7) – understand process management including process state transition, synchronization, mutual exclusion, resource allocation graph, deadlock prevention and detection, banker's algorithm.
- CPU Scheduling (chapter 5) - Understand different process scheduling algorithms, e.g., FIFO, RR, SRTF, Multi-Level Feedback Queue scheduling, understand how to evaluate the algorithms using throughput, response time, and average waiting time.
- Memory management (chapters 8, 9) - Understand the role of the main memory for a process execution and different contiguous allocation and dynamic allocation algorithms related to main memory management; Understand virtual memory concept and understand paging system, page fault processing, different page replacement algorithms, how TLB works with the paging subsystem and how to evaluate the system performance with effective access time.
- File System Interface and Implementation (chapters 10,11) - Understand file system interface and internal file system implementation, understand the file directory implementation with contiguous allocation, linked allocation, indexed allocation with examples on UNIX i-node structure.
- I/O Systems (chapters 12.1-12.5, 13) - Understand disk management with different disk head seeking algorithms, understand the work flow of I/O system.

Assignments: in the form of programming and regular written/computing homework.

Exams: There will be three exams scheduled as follows (Tentative Schedule).

- Exam I: Topics on process management, cpu scheduling, and deadlock
- Exam II: Topics on memory management, file system, I/O, disks etc.

Grading: The final grade will be based upon the following weights:

- Participation (pop quizzes, attendance, etc.) 15%
- Assignments 35%
- Exams 50%

- Grading Scale:

95% - - 100%	4.0

85% - - 94%	3.5-3.9
75% - - 84%	3.0-3.4
55% - - 74%	2.0-2.9
45% - - 54%	1.0-1.9
<45%	0.0

Note: The total grades shown in Moodle do not reflect the proportions above. So, do your own calculation for grades using the proportions.

Course Regulations:

- **No Show Policies:** classroom lecture attending will guarantee the quality of the teaching and learning. Students should commit the lectures. It is your own responsibility to balance the study and your work (if you have one). The attendance is counted from the second lecture. Medical and emergency need to provide evidence to the instructor.
- **Late Policies:** This course covers a lot of material and late assignments will seriously impact your overall experience of learning. Assignments are due at 11:55pm (EST) on the due date. After that the assignments will not be graded (**NO EXCEPTION**). Please try to start earlier, finish, and submit your assignments on time.
- **Cooperation and Cheating:** Feel free to discuss homework/assignments with other students of the class, teaching assistant, and instructor. However, DO NOT look at or copy another student's solution to homework assignment and exams. I am not concerned with how you come to understand the problem and how to solve it, but once you have the background necessary to solve it, you must provide your own solution. Exchanging homework assignments solutions or copying from Internet is cheating and will be reported to the University, and you will receive an automatic grade of **0** on the course. All students must be aware of the contents of Academic Conduct Regulations (http://www2.oakland.edu/deanofstudents/handbook/acr.cfm).
- **Please TURN OFF ALL** electronic devices during the lecturing time.
- **No MAKEUP for the exams.** All exams will cover topics from lectures and assignments. However, the lecture slides serve only the backbone of the course, a lot of materials should be found from the referred textbook. One page (could use double sides) of A4 ‘cheating sheet’ (no font size limitation) is permitted during the exams.
- In **case of Emergency,** the exam could be rescheduled ahead of time. An official document would be needed as evidence.

Program Outcomes: Program outcomes are a set of skills that assure the achievement of the program educational objectives and are necessary for professional engineering practice. Before graduating, SECS students will demonstrate their skills in the following key areas:

a. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
b. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
c. An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.
d. An ability to function effectively on teams to accomplish a common goal.
e. An understanding of professional, ethical, legal, security, and social issues and responsibilities.
f. An ability to communicate effectively with a range of audiences.
g. An ability to analyze the local and global impact of computing on individuals, organizations and society.
h. Recognition of the need for, and an ability to engage in, continuing professional development.
i. An ability to use current techniques, skills, and tools necessary for computing practice.
j. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
k. An ability to apply design and development principles in the construction of software systems of varying complexity.