

CS 330 – Operating Systems

Weisberg Division of Engineering and Computer Science
College of Information Technology & Engineering
Marshall University

Semester and Year:

Fall, 2008

Classroom Sections, Locations, and Meeting Times:

Section: 101 CRN: 2078 Days: MW Time: 2:00 – 3:15 Location: GH206A

Textbook:

Garrido and Schlesinger, *Principles of Modern Operating Systems*, Jones and Bartlett, ISBN 978-0-7637-3574-6

Course Description:

Modern operating systems design and implementation: multi-tasking and time sharing, concurrency and synchronization, interprocess communication, resource scheduling, memory management, deadlocks, I/O, file systems, and security

Pre-requisite:

CS 210 – Algorithm Analysis and Design

Instructor:

Jonathan F. Thompson

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Office Hours: 9:30 – 11:30 MTW

Course Outcome Objectives:

At the completion of this course the student will be able to:

1. Describe the basic components of a computer and how they interact with an operating system.
2. Describe classes of operating systems, roles of an operating system, and the services an operating system provides under each role to applications and users.
3. Understand process and thread concepts and how an operating system manages processes.
4. Explain issues in concurrency and mutual exclusion, process synchronization, and interprocess communication, and demonstrate how the solutions provided by an operating systems to these issues can be utilized by applications and users.
5. Describe how input and output devices interface with an operating system.
6. Understand why deadlocks arise in operating systems and their implications, and explain algorithm(s) for avoiding, detecting, and recovering from deadlocks.
7. Understand, compare, and contrast various processor scheduling algorithms.
8. Understand, compare, and contrast various disk scheduling algorithms.
9. Articulate the motivation for memory hierarchy, explain techniques for implementing virtual memory, and illustrate how application performance can be improved via reducing virtual memory related overhead.
10. Explain file system and directory structure concepts, understand tradeoffs in their design and implementation, and demonstrate how applications interface with a file system.
11. Demonstrate insight into the design and implementation of two major operating systems.

Course Activities:

Reading Assignments

You are expected to review the sections of the textbook that compose the in-class topics before the class in which they are covered.

In-class Quizzes

There will be ten quizzes during the semester. Each quiz will be given on a Wednesday, will take about five minutes, and will be given at the beginning of class. The questions will be on the topics that were covered in the prior two class sessions.

Programming Assignments

There will be four programming assignments to demonstrate the implementation of the theoretical material presented in the text. You are expected to complete the assignments outside of class and submit them on or before the due date.

Homework Assignments

There will be ten homework assignments due on assorted Wednesdays during the semester.

Research Report

Each student will explore a current trend in operating systems by performing independent research on a focused technical topic. A written report of this research must be prepared and submitted in hard-copy and electronic form (in either Microsoft Word or Adobe PDF format). In addition, each student will give a 10 minute presentation to the class describing the results of this research.

Lab Assignments

There will be several lab assignment to provide you with hands-on activities. We will provide in-class time to work on the lab assignment but if you do not get finished, you are expected to complete the assignment outside of class. Check the Gullickson Hall Room 206A room schedule to determine when the lab is open during non-class hours.

Exams

There will be a 75 minute mid-term and a 120 minute final exam.

Class Attendance, Participation, and Decorum

Students are expected to attend all class sessions and participate in class activities. Students are also expected to maintain a certain level of decorum that includes turning off (or silencing) cell phones, arriving to class on time, not sleeping during class, and keeping side conversations to a minimum.

Evaluation/Grade Computation:

Your final grade is computed by multiplying each Student Activity score by the weighted percentage and summing all of the weighted percentage values.

Student Activity	Score	Weighted %	Value	
In-class quizzes		x 0.10		
Programming Assignments		x 0.15		
Homework Assignments		x 0.15		
Research Report		x 0.10		
Lab Assignments		x 0.05		
Midterm		x 0.15		
Final Exam		x 0.20		
Class Attendance, Participation, and Decorum		x 0.10		
Grand Total =				
Evaluation Scale				
90 & Above = A	80 - 89 = B	70 - 79 = C	60 - 69 = D	59 & Below = F

Course Time

The Undergraduate Catalog says that students should plan on spending two hours of preparation time for each class hour. The course assignments and activities are designed so that you should be able to complete them within this recommended time.

In-class	45 hours
Reading assignments	15
Research Report	10
Homework	30
Quiz preparation	10
Exam preparation	8
Programming Assignments	16
Total preparation time	89 hours

Schedule of Topics:

Date	Wk	Lecture	Lab	HW/Quiz	Program
25-Aug	1-M	Course Intro Ch 1 – Overview			
27-Aug	1-W		MINIX		
01-Sep	2-M	No class – Labor Day			
03-Sep	2-W	Ch 2 – Processes and Threads	MINIX PCB	HW1 due	Program 1 Due
08-Sep	3-M	Java threads	Thread program	Quiz 1	
10-Sep	3-W		Linux commands	HW2 due	
15-Sep	4-M	Ch 3 – System Models		Quiz 2	
17-Sep	4-W	Ch 4 – Multiprogramming	Simulation	HW3 due	
22-Sep	5-M	Ch 5 - Scheduling		Quiz 3	
24-Sep	5-W		Sched simulation	HW4 due	
29-Sep	6-M		MINIX scheduler	Quiz 4	Program 2 Due
01-Oct	6-W		MINIX scheduler	HW5 due	
06-Oct	7-M	Mid-term exam review		Quiz 5	
08-Oct	7-W	Mid-term Exam			
13-Oct	8-M	Ch 10 – Memory Mgmt			
15-Oct	8-W	Ch 10 - cont			
20-Oct	9-M	VM Simulator Intro	MINIX VM	Quiz 6	
22-Oct	9-W	Ch 6 – Synchronization		HW6 due	
27-Oct	10-M	Ch 6 – cont	Java Monitor	Quiz 7	
29-Oct	10-W			HW7 due	Program 3 Design Due
03-Nov	11-M	Ch 7 – Deadlocks		Quiz 8	
05-Nov	11-W	Ch 7 – cont		HW8 due	
10-Nov	12-M	Ch 8 – File Management		Quiz 9	
12-Nov	12-W	Ch 8 – cont	Minix File Mgmt	HW9 due	
17-Nov	13-M	Ch 9 – I/O System		Quiz 10	Program 3 Due
19-Nov	13-W	Presentations 1 – 5		HW10 due	
24-Nov		No class – Thanksgiving			
27-Nov		No class – Thanksgiving			
01-Dec	14-M	Presentations 6 – 10			
04-Dec	14-W	Presentations 11 – 15			
08-Dec	15-M	Final Exam Review			
15-Dec		Final Exam	2:00 – 4:00pm	GH206A	

Exam Attendance

Students are required to take exams at the scheduled class period. Students may take an exam at a different time under one of the following conditions:

- They present a University Excused Absence
- They present a valid medical excuse
- Other extraordinary circumstance as determined by the instructor

Academic Conduct:

Working through the homework problems, the programming assignments, and the lab exercises are key factors in assuring your command of the course material. To encourage completion of these assignments, a significant portion of the final grade will be based on your performance in these exercises.

You are allowed and encouraged to work with other students on the completion of these assignments, subject to the following constraints:

- copying someone else's work and submitting it as your own is plagiarism and will not be tolerated
- you may work with others to develop a solution to a problem but the material you submit must be your own work and you must acknowledge your collaborators
- unless designated as a team exercise, you may not sub-divide the tasks of an assignment; each student is expected to complete the whole assignment

It is your responsibility to satisfy the spirit of this conduct. If you have any questions, please ask the instructor for clarification. Depending on the severity of the offense, the instructor may:

- Take no action
- Penalize the student on the assignment in question
- Assign the student a failing grade in the course

Communication:

Assignments, lecture notes, class communications (e-mail), etc, are all handled via the online course site. Be sure to log in regularly to check for course news.

Adaptive Methods for Disabilities:

Students with disabilities who believe that they may need accommodations in this class are encouraged to contact the instructors as soon as possible to better ensure that such accommodations are implemented in a timely fashion. A reasonable period of time must be given to the instructors when making your initial request for any accommodation.

Acknowledgement

Many of the PowerPoint slides in this course were created by Professor Matt Welch of Harvard University and are used with his permission.

Bibliography:

Flanagan, David, *Java in a Nutshell*, 5th Ed. O'Reilly & Associates, Inc, Sebastopol, CA 95472
Silberschatz, Galvin, Gagne, *Operating System Concepts*, 7th Ed., Wiley, Hoboken, NJ, 07030
Stallings, William, *Operating Systems: Internals and Design Principles*, 5th Ed., Upper Saddle River, NJ 07458
Tannenbaum, *Operating Systems: Design and Implementation*, 3rd Ed, Prentice Hall

Internet Web Sites:

MINIX 3 Operating System
VMWare

www.minix3.org
www.vmware.com