

# CS 330 – Operating Systems

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

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**Semester and Year:**

Fall, 2009

**Classroom Sections, Locations, and Meeting Times:**

Section: 101    CRN: 1973    Days: MW    Time: 2:00 – 3:15    Location: GH206A

**Textbook:**

Silberschatz, Galvin, and Gagne, *Operating Systems Concepts 8<sup>th</sup>Ed*, John Wiley, ISBN 978-0-470-12872-5

**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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**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 a series of quizzes given during the semester covering each of chapters 1 through 13. They will be given at the beginning of class and will take about five minutes to complete. Practice quiz questions for each chapter will be available on MUOnline. The graded quiz will consist of six questions taken from the pool of practice quiz questions for the chapter.

### *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.

### *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. A draft version of the report will be due in week twelve so that students can receive feedback prior to submitting the final version.

### *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 0.15	
Programming Assignments		x 0.25	
Research Presentation and Report		x 0.15	
Midterm		x 0.15	
Final Exam		x 0.20	
Class Attendance, Participation, and Decorum		x 0.10	
Grand Total =			
<b>Evaluation Scale</b>			
90 & Above = A	80 - 89 = B	70 - 79 = C	60 - 69 = D
			59 & Below = F

## Schedule of Topics:

Week of	Wk	Monday	Wednesday
24-Aug	1	Course Introduction Ch 1 – Overview	Ch 2 – OS Structures Project 1 Assigned (2.28)
31-Aug	2		Ch 3 – Processes Quiz Ch 1
07-Sep		No class – Labor Day	Quiz Ch 2
14-Sep	4	Ch 4 – Threads Project 1 Due Project 2 Assigned (3.23)	Quiz Ch 3 Threads lab
21-Sep	5	Ch 5 – CPU Scheduling	Ch 6 – Process Synchronization Quiz Ch 4
28-Sep	6	Ch 7 – Deadlocks	Ch 8 – Main Memory Quizzes Ch 5, 6 Project 2 Due
05-Oct	7	Mid-term exam review	<b>Mid-term Exam (Ch 1-6)</b>
12-Oct	8	Ch 9 – Virtual Memory Project 3 Assigned	Quizzes Ch 7, 8
19-Oct	9	Ch 10 – File-System Interface	Quiz Ch 9
26-Oct	10	Ch 11 – File-System Implementation	Quiz Ch 10 Project 3 Due
02-Nov	11	Ch 12 – Mass-Storage Structure Project 4 Assigned	Quiz Ch 11
09-Nov	12	Ch 13 – I/O Systems Research Report Draft Due	Ch 14 – Protection Quiz Ch 12
16-Nov	13	Presentations 1 – 5 Quiz Ch 13	Presentations 6 – 11 Project 4 Due
23-Nov		No class – Thanksgiving	No class – Thanksgiving
30-Nov	14	Presentations 12 – 16	Presentations 17 – 21
07-Dec	15	Final Exam Review Research Report Due	
14-Dec		<b>Final Exam</b>	

## 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

## Communication:

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

## 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

## Policy for Students with Disabilities:

Marshall University is committed to equal opportunity in education for all students, including those with physical, learning and psychological disabilities. University policy states that it is the responsibility of students with disabilities to contact the Office of Disabled Student Services (DSS) in Prichard Hall Room 117, phone 304 696-2271 to provide documentation of their disability. Following this, the DSS Coordinator will send a letter to each of the student's instructors outlining the academic accommodation they will need to ensure equality in classroom experiences, outside assignment, testing and grading. The instructor and student will meet to discuss how the accommodation(s) requested will be provided. For more information, please visit <http://www.marshall.edu/disabled> or contact Disabled Student Services Office at Prichard Hall Room 117, phone 304-696-2271.

## Acknowledgement

Many of the 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*, 5<sup>th</sup> Ed. O'Reilly & Associates, Inc, Sebastopol, CA 95472

Stallings, William, *Operating Systems: Internals and Design Principles*, 5<sup>th</sup> Ed., Upper Saddle River, NJ 07458

Tannenbaum, *Operating Systems: Design and Implementation*, 3<sup>rd</sup> Ed, Prentice Hall

## Internet Web Sites:

MINIX 3 Operating System

[www.minix3.org](http://www.minix3.org)

VMWare

[www.vmware.com](http://www.vmware.com)