

# CS 330 – Operating Systems

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

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**Semester and Year:**

Fall, 2007

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

Section: 101    CRN: 2105    Days: TR    Time: 2:00 – 3:15    Location: GH206A

**Textbook:**

Tannenbaum, *Operating Systems: Design and Implementation, 3<sup>rd</sup> Ed*, Prentice Hall, ISBN 0-13-142938-8

**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*

Office Location: Gullickson Hall Room 205C

Phone: (304) 696-6349

Departmental Fax: (304) 696-5454

Email: thompsonj@marshall.edu

**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 (by writing and debugging concurrent programs) 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, and demonstrate knowledge about the process for developing device drivers.
6. Understand why deadlocks arise in operating systems and their implications, and explains 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.

## Course Outcome Objectives - continued:

11. Explain operating system security mechanisms and vulnerabilities and demonstrate how applications and users can make use of the operating systems security.
12. Demonstrate insight into the design and implementation of two major operating systems.

## Course Activities:

### *In-class Quizzes*

There will be a quiz for each chapter that we cover in the textbook this semester. Approximately twenty possible quiz questions regarding chapter material will be handed out a week in advance of the quiz. The student is expected to complete the chapter reading assignment and answer the quiz questions as they go to prepare for the quiz. Six of the twenty questions will appear on the in-class closed-book, closed-notes quiz. Each quiz will take about five minutes and will be given at the beginning of class.

### *Programming Assignments and Discussion*

There will be several 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 it on or before the due date. You may be asked to present your solution to the class.

### *Homework Assignments and Discussion*

Homework will be assigned on a regular basis. You must bring in a copy of your homework on the due date (feel free to use the copier in GH112). You will be expected to turn in the original at the start of class and refer (and perhaps annotate) your copy during discussion of the problems. You may be asked to present your problem solution to the class.

### *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. The computer science lab in Gullickson Hall Room 206A is open during non-class hours during the day Monday through Friday from 9:00 to 4:00. The lab is also open between 4:00 and 9:00pm, Monday through Thursday.

### *Exams*

There will be a 75 minute mid-term and a 120 minute final exam. The written portion of the exams will be closed-book but you will be allowed to bring in a page or two of hand-written notes. The programming portion of the exams will be open-book and open-notes.

## Course Activities - continued:

### *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:

Course grades are based on weighted percentage averages. Your final grade will be derived by multiplying each individual Student Activity score by the weighted percentage and summing all of the weighted percentage averages.

Student Activity	Individual Score	Weighted %	Weighted % Average
In-class quizzes		x 0.10	
Programming Assignments and Discussion		x 0.15	
Homework Assignments and Discussion		x 0.15	
Research Report		x 0.10	
Lab Assignments		x 0.05	
Midterm		x 0.20	
Final Exam		x 0.25	
Grand Total =			

Evaluation Scale				
90% & Above = A	80% - 89% = B	70% - 79% = C	60% - 69% = D	59% & Below = F

## Schedule of Topics:

Week	Tuesday	Thursday
1 20-Aug	Introduction	
2 27-Aug		Processes
3 3-Sep		
4 10-Sep		
5 17-Sep		
6 24-Sep	Input/Output	
7 1-Oct	Midterm Exam	
8 8-Oct		
9 15-Oct		Memory Management
10 22-Oct		
11 29-Oct		
12 5-Nov	File Systems	
13 12-Nov		
	19-Nov	Thanksgiving Break (no class)
14 26-Nov	Research Presentations	
15 3-Dec	Last Class	

## 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 is a key factor in assuring your command of the course material. To encourage completion of these assignments, a significant portion of the final grade (43%) 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 one of the instructors for clarification. Depending on the severity of the offense, the instructors 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 course WebCT/Vista site. Be sure to log into WebCT/Vista 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.

## Bibliography:

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

## Internet Web Sites:

MINIX 3 Operating System  
VMWare

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