Marshall University Syllabus

Course Title/Number	Operating Systems/ CS 330
Semester/Year	Fall/2022
Days/Time	Thursday/4:00 - 6:20
Location	WAEC 3123
Instructor	Brent Maynard
Office	TBD
Phone	304-696-2591
E-Mail	brent.maynard@marshall.edu
Office/Hours	by appointment only
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

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. (PR: CS 210 – Algorithm Analysis and Design)

Course Student Learning Outcomes

Course Student Learning Outcomes, Students will be able to	How students **will practice** each outcome	How **student achievement of each outcome will be assessed** in this course
Describe how an operating system interacts with the basic hardware components of a computer	In class lab exercises In class examples	In-class Quizzes Graded programming assignments Graded exam problems
Describe how OS manage process, input and output, file, and memory system	In class lab exercises In class examples	In-class Quizzes Graded programming assignments Graded exam problems
Demonstrate in-depth knowledge of a current topic in Operating Systems and	In class lab exercises In class examples	Research report In-class presentation

Configure and deploy
hypervisor to host multiple
OS instances

Required Texts, Additional Reading, and Other Materials

Required Text

Silberschatz, Galvin, and Gagne, *Operating Systems Concepts with Java 10th Ed*, John Wiley, 2018, ISBN 978-1-119-32091-3

Additional Reading

None

Other Materials

Flanagan, David, *Java in a Nutshell, 5th Ed.* O'Reilly & Associates, Inc, Sebastopol, CA 95472

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

MINIX 3 Operating System   www.minix3.org

VMWare   www.vmware.com

Course Requirements / Due Dates

In-class Quizzes

Programming Projects
- There will be programming projects to demonstrate the implementation of the theoretical material presented in the text. You are expected to complete these assignments outside of class and submit them on or before the due date. In addition to the program, each student must submit a written report that consists of a problem statement, the solution methodology, and a description of the results of your effort. See the Course Schedule section below for the due dates of these assignments.

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 hardcopy and electronic form in PDF format. Each student will also give a ten-minute presentation to the class describing their research. These presentations will be given in the last two weeks of class.

Exams

There will be a midterm and final exam.

Grading Policy

Activity	Weight
Attendance	10%
In-class Quizzes	15%
Programming Projects and Reports	20%
Research Presentation and Report	15%
Midterm Exam	15%
Final Exam	25%

The course grade will be awarded based on the following scheme:

Score	Letter Grade
≥ 90	A
≥ 80 & < 90	B
≥ 70 & < 80	C
≥ 60 & < 70	D
< 60	F

Attendance Policy

Attendance is required. Only University Excused Absences will be accepted. Attendance counts for 10% of the overall course grade.

Course Schedule

Wk	Tuesday	Thursday
1		
2		
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14		

Course Topics

Computer System Architecture
Operating-System Structure
Operating-System Services
System Calls
Virtual Machines
System Boot
Processes and Threads
Operations on Processes
Interprocess Communication
Communication in Client –Server Systems
Multithreading Models
Threading Issues
Scheduling
Scheduling Criteria
Scheduling Algorithms
Thread Scheduling
Multiple-Processor Scheduling
Synchronization
The Critical-Section Problem
Synchronization Hardware
Semaphores
Classic Problems of Synchronization
Monitors
Atomic Transactions
Deadlocks
Deadlock Characterization
Methods for Handling Deadlocks
Deadlock Prevention and Avoidance
Deadlock Detection and Recovery

Virtual Memory
Paging
Structure of the Page Table
Segmentation
Demand Paging
Page Replacement
Allocation of Frames
Thrashing
Memory-Mapped Files
Allocating Kernel Memory
File System
File Access Methods
Directory and Disk Structure
File Sharing
File Protection
File-System Structure and Implementation
Directory Implementation
File Allocation Methods
File Free-Space Management
Mass Storage Devices
Disk Structure
Disk Scheduling and Management
Swap-Space Management
RAID Structure
Stable-Storage Implementation
Tertiary-Storage Structure
I/O Systems
I/O Hardware
Application I/O Interface
Kernel I/O Subsystem
I/O Requests to Hardware Operations