CSE 410: Computer Systems
Final Exam Review Guide

The exam is on Wednesday, December 15th at 8:30 a.m. The exam is comprehensive but will concentrate heavily on material since the midterm.

Chapter 2

- Hardware support for operating systems: dual-mode operation (kernel mode vs. user mode), memory protection, timers
- Privileged instructions

Chapter 3

- OS components: process management, memory management, file management, I/O system management, disk management
- System calls

Chapter 4

- Processes
- Process states: new, running, waiting, ready, terminated
- Process control block
- Process context switch
- Process creation: directed approach, fork/exec
- Threads
- Thread context switch

Chapter 5

- CPU bursts and I/O bursts
- Preemptive vs. non-preemptive scheduling
- Scheduling criteria: CPU utilization, throughput, turnaround time, waiting time, response time
- FCFS, SJF, Round Robin

Chapter 6

- Atomic instructions
- The havoc wreaked by interrupts at awkward times
- Critical sections
- Critical sections solutions: mutual exclusion, progress, bounded waiting
- Turning off interrupts - when is this appropriate?
- Spinlocks - when is this appropriate?
- Semaphores, P() and V()
- Monitors
- Busy waiting

Chapter 7

- Deadlock
- Four necessary conditions for deadlock: mutual exclusion, hold and wait, no preemption, circular wait
- Deadlock prevention, deadlock avoidance, deadlock detection, and deadlock recovery
- Safe, unsafe, and deadlock states

- Wait-for graphs

Chapter 8

- Physical vs. Virtual addresses
- Swapping
- Contiguous allocation
- External and internal fragmentation
- Compaction
- Paging
- TLB
- Address translation
- Page table base register (PTBR)
- Single-level page table (no questions on multiple-level or inverted page tables)
- Shared pages

Chapter 9

- Demand paging
- Page replacement
- FIFO, LRU. (No questions on FIFO with second chance because your book botches the explanation.)

Chapter 10

- Files and directories
- File operations: creation, reading, writing, seeking, deleting, truncating, opening, closing

- Access methods: sequential, random
- Directory structures: single level, two-level, tree, acyclic graph, general graph
- Protection: access control lists
- Consistency semantics: changes visible immediately, changes visible on close, no sharing

Chapter 11

- Allocation methods: contiguous, linked, indexed
- Free space management

Other Things to Think About

- Distributed file systems - statelessness vs. statefulness for supporting large numbers of clients
- If you still don't know your hex numbers, now might be a good time to learn
- Themes that kept cropping up all quarter: levels of abstraction, caching, performance. It might be a good idea, for example, to think about all the caches we've seen, what they have in common, and how they differ.

Good luck and best wishes!