

Date: **Section 1 (9:30am regular class time):**
Tuesday, December 16, 2008
7:45am to 9:45am; please be there by 7:40am
McB 231

Section 2 (11:00am regular class time):
Wednesday, December 17, 2008
2:05pm to 4:05pm; please be there by 2:00pm
McB 230

To ensure that there is space for everyone, I ask that you attend the same section that you attend for lecture. If this causes a conflict for you, you must let me know before hand for an exception.

Format:

The final exam will consist of 4-7 questions. It will be **closed book, closed notes, closed computer/without wireless access**. However, you are **allowed to bring one letter-sized sheet of paper with prepared notes** (you may use front and back of that sheet.) In addition, you **may also bring the sheet of notes you previously prepared for the midterm**.

You are responsible for the content of lectures 1 through 27. This includes, among others:

- Introduction to OS: general goals & principles of operating systems.
- Threads & processes: context switching, mode switching, procedure switching, context management, threading & process APIs. User-level vs. Kernel-level threading models.
- Concurrency & Synchronization: critical section problem, race conditions, approaches for guaranteeing mutual exclusion, including locks, semaphores, monitors, spinlocks & disabling interrupts.
- Deadlock: conditions, detection & recovery.
- Scheduling: general goals & constraints, priority scheduling, FCFS, RR, SPN, MLFQS, Lottery Scheduling.
- Virtual memory basics: address translation, memory protection, page table & TLB management; physical memory management: buddy systems and bitmap-based allocation; virtual page replacement strategies, working set & thrashing; segmentation.
- Disks & File systems: disk characteristics, buffer cache, general design of file systems, file allocation & layout strategies including indexed files, directory representation and lookup, consistency in file systems, write-ordering & journaling, virtual

file system interfaces, volume management, RAID designs, advanced file system techniques.

- Security and Protection: principles of protection, authentication, authorization, and models for access enforcements. Security attacks and their prevention.
- Virtual machine: types of virtual machines, applications of virtual machine, implementation techniques

More weight will be given to material covered since the midterm.

Silberschatz covers this material in Chapters 1-12, 14-15.

The final may contain questions related to projects 0-4.