EECE 315: Review Session

Lecture 11

What will we cover this class ?

- Quick overview of each topic
  - 2-3 slides per topic + common mistakes/gotchas
- I will answer questions on each topic during the session. Do not wait to ask questions at the end.
- The exam may test you on material that is not covered in this class (so read the whole notes)
  - However, we will touch upon all topics in the review

Final Exam Topics

- System Architecture
- Processes and Threads
- Synchronization
- Scheduling
- Memory Protection
- Virtual memory
- File Systems Interface and Implementation
- Real-time Systems
- Networks and Distributed Systems

System Architecture

- Interrupt handling and management
- Polling versus DMA transfer
- OS structure and functions
- Levels of storage hierarchy
- What happens on a system call

Processes and Threads

- Process and elements of process state
- How does context switching work
- Process creation using fork and wait
- Inter-process communication primitives
- Differences between kernel and user-level threads

Synchronization

- Critical section problem and constraints
- Peterson's algorithm
- Hardware solutions (e.g., TestAndSet)
- Semaphores use and implementation
- Classical synchronization problems

Scheduling

- Scheduling criteria: average wait time
- Non-preemptive scheduling: FCFS, SJF
- Preemptive scheduling: RR, SRTF
- Multi-level queues and scheduling classes

Memory Protection

- Contiguous memory allocation: Fragmentation
- Paging and Paging hardware (TLBs etc.)
- Page Table Entries (protection bits)
- Multi-level Page Tables (2-level and 3-level)

Virtual Memory

- Demand Paging Concept and implementation
- Page replacement and Belady's anomaly
- FIFO, LRU and Second chance algorithms
- Thrashing and working set tracking
- Memory mapped files and I/O

File Systems Interface

- Concepts of files and directories
- File access methods and locking
- Directory structures and mounting
- Protection and permissions

File System Implementation

- File system layers & Virtual File System (VFS)
- File control block and in-memory structures
- File Allocation: Sequential, Linked and Indexed
- Free Space Management: Bitmaps, Linked
- Performance: Unified Vs Separate Buffer Caches

Networks and Distributed Systems

- Characteristics of a distributed system: Pros and Cons
- Difference between Network OS and distributed OS
- Addressing, routing, packet switching and contention management
- Typical network stack: TCP/IP implementation
- Distributed File System: Naming, Transparency, Caching

Some final thoughts ….

- Prepare well for the exam – understand the concepts from first principles, solve all in-class exercises, quizzes. Try the sample exam before looking at solutions (and discussing it)
  - Brush up on basic knowledge of NachOS

- Post questions to Piazza – I will answer questions during exam period until April 15th

The Road Ahead

- UBC Courses
  - EECE 358: Computer Communications
  - EECE 411: Distributed Systems
  - EECE 494: Real-time Systems
  - EECE 412: Computer security
  - EECE 417: Software architecture
  - EECE 465: Microcomputer System Design
  - EECE 476: Computer Architecture
- Software Engineer: Rated No. 1 career by Wall Street Journal

Requests and Announcements

- **Teaching evaluations are online**
  - Please take the time to fill them before April 11th
  - I would really appreciate your feedback/comments
  - Tell me what you liked or didn't like – can benefit future generations of students who take this course
  - Department takes these seriously for assessments

- **Any changes to the grades released so far**
  - Notify us on Piazza before April 9th (Wednesday)