CSI 3131 Winter 2023
Operating Systems

Instructor: Mohammad Alnabhan

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Office: STE 5084

Office Hours: Monday @ 3:00 PM – 4:00 PM

Course Website: Brightspace

Enquiry Center: Brightspace Discussion Group – NO EMAILS

Textbook and Reading

- **Course Notes:**
  - Made available on PDF files

- **Textbook:**
  - *Operating System Concepts* by Silberchatz, Galvin, Gange, 10th Ed., John Wiley & Sons Inc., 2018

- **Other useful books:**
  - *"Operating Systems: Internals and Design Principles"* by William Stallings, 9th Ed., Pearson, 2018.

  - *"Modern Operating Systems"* by Andrew S. Tanenbaum, 4th Ed., Pearson, 2015.

Schedule

- **Lectures**:
  - Tuesdays   16:00 – 17:20   STE B0138
  - Thursdays   14:30 – 15:50   STE B0138

- **Lab/Tutorial**
  - Tutorials 1 (Thurs)   16:00 – 17:20   CRX C030
  - Tutorials 2 (Thurs)   16:00 – 17:20   CRX C040
  - Lab 1 (Tues)   17:30 – 18:50   CBY B02
  - Lab 2 (Thurs)   17:30 – 18:50   CBY B02

  Labs and Tutorials will start in Week 2.

- Tutorials: Theoretical exercises.

- Labs: To gain experience with tools used to complete the assignments.

Grading

Assignements (A):   **15%**   **3 or 4**   **(20% if 4 assignments)**
Participation: **5%** (NEW)
Midterm (M):   **30%**
Final Exam (E):   **50%**

Attendance Policy:

- A minimum of 80% attendance policy is being forced.
- No marks on attendance, but we will counting participations during lectures.
- Extra marks may depend on attendance and participation

You must have at least 50% on M+E to pass the course.

Assignments and Exams

Assignments

- C-programming under Unix/Linux (process creation/IPC)
- Process synchronization using semaphores (in Java)
- Implementing parts of a basic OS in a simple simulator (in Java)

Exams

- Closed book
- Diverse format: **multiple choice**, answer questions, solve problems
- Need to know and understand concepts and algorithms, as well as being able to apply this knowledge

Midterm

- **February 16, 2022 (Thursday, 14:30 – 15:20 during Class)**
- Tentative material, Module 1 to 5, Process synchronization (Ch 1 to 6 in textbook).

Final

- Comprehensive, with more weight on post-midterm topics **(TBD)**

Office Hours and After Lectures

- **What are students expecting:**
  - During Lectures? The kind of questions the professor will answer!
  - After Lectures questions?
  - During Labs?
  - During Tutorials?
  - Professor Office hour?
  - TA Office hour?

Course Organization Questions?
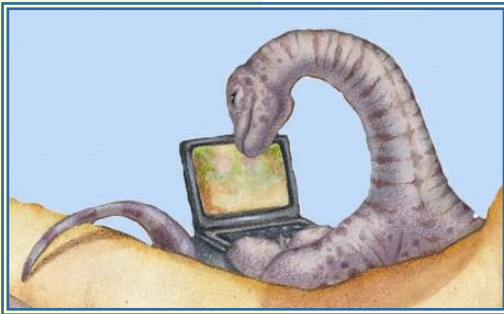
Course Objectives

You are expected to:

- Learn basic concepts and principles behind the design of operating systems

- Get exposed to the problems operating systems designers face, explore the tradeoffs and solutions to these problems

- See how are these issues solved in practice in real operating systems

- Be able to apply these concepts and techniques in relevant circumstances

- Get some hands-on experience programming OS type problems (process creation, inter-process-communications, process synchronization, mutual exclusion, deadlock avoidance)

Topics Covered

- What Operating Systems Do
- Computer-System Organization
- Computer-System Architecture
- Operating-System Structure
- Operating-System Operations

Background/intro

- **Process Management**
- **Memory Management**
- **Storage and I/O Management**

The main stuff

- Protection and Security
- Distributed Systems
- Special-Purpose Systems
- Computing Environments

Advanced topics, not covered

Topics Covered

Introduction/Background/Overview

- Computer systems overview
- Operating systems overview: interface, system calls, design and implementation issues, OS structure

Process Management

- Processes and threads
- Interprocess communication
- CPU scheduling – algorithms and criteria
- Process/thread synchronization – problems and solutions
- Deadlocks – prevention, avoidance, detection, recovery

Topics Covered (contd.)

Memory Management

- Basic main memory management (swapping, contiguous memory allocation, paging, segmentation)
- Virtual memory (demand paging, copy-on-write, page replacement, allocating kernel memory)

Storage Management and Input/Output

- File-System interface (files, directories, mounting file system, file sharing)
- File-System implementation
- Mass-storage structure (disk structure, scheduling, management)
- Swap space management
- I/O systems (hardware, application I/O interface, kernel I/O subsystem)