CSE 4001 - Operating Systems Concepts

Syllabus SPRING 2018
Dr. E. Ribeiro

Contents

1 Course description

The course examines the design and implementation of operating systems. An operating system is a piece of software that (a) manages hardware resources in computers, (b) makes it possible to users and other software applications to access the system. CSE4001 introduces concepts and implementation of operating systems.

Topics covered:

- OS Structures
- Processes and Threads
- CPU Scheduling
- Process Synchronization
- Memory (and Virtual Memory)
- File-Systems
- I/O Systems

2 Instructor information

Dr. Eraldo Ribeiro
Associate Professor of Computer Science
Florida Institute of Technology
School of Computing
Melbourne, Florida.
e-mail: eribeiro@cs.fit.edu
url: `cs.fit.edu/~eribeiro`

3 Prerequisites

CSE 2010 (Grade $\geq$ D) and CSE 2120 (Grade $\geq$ D) or ECE 2552 (Grade $\geq$ D).

4 Meeting times

Lectures

Tuesdays and Thursdays, from 11.00pm - 12.15pm
Room: CRF, Room 112

Office hours

Tuesdays, from 2.30pm to 4.00pm, or by appointment.

During my office hours, we can also meet via Skype. For skype meetings outside my office hours, email me for a time. My work-related skype username is `eribeiro_fit`.

5 Textbook

Required:

- **Operating Systems: Three Easy Pieces**, Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau Arpaci-Dusseau Books March, 2015 (Version 0.90)

  Available online free of charge from:
  `http://pages.cs.wisc.edu/~remzi/OSTEP/`.

- **xv6, a simple, Unix-like teaching operating system**, Frans Kaashoek, Robert Morris, and Russ Cox. From MIT's OS engineering course.

  Available online free of charge from:
  `http://pdos.csail.mit.edu/6.828/2014/xv6/book-rev8.pdf`

- **The Little Book of Semaphores**, by Allen B. Downey. Green Tea Press.

  Available online free of charge from:
  `http://greenteapress.com/wp/semaphores/`

Optional:

- Operating System Concepts, Abraham Slibershcatz, Peter B. Galvin, and Gret Gange, John Wiley & Sons, Inc.

- Operating Systems In Depth: Design and Programming, Thomas W. Doeppner, Wiley.
- Operating System, Internals and Design Principles, William Stallings, Prentice-Hall.
- Modern Operating Systems, Andrew S. Tanenbaum, Prentice-Hall.
- Operating Systems Design and Implementation, Andrew S. Tanenbaum and Albert S. Woodhull, Prentice-Hall.

6 Grading

- **5%**: Quizzes.
- **30%**: Assignments.
- **30%**: Midterm exams.
- **35%**: Final exam.

Grading ranges: 90-100=A, 80-89=B, 70-79=C, 60-69=D, 0-59=F.

Assignments include in-class quizzes, programming tasks, and presentations. All programs will be developed using the Unix/Linux environment and the C/C++ programming language (unless explicitly specified otherwise by the instructor).

7 Collaboration policy

Unless stated otherwise by the instructor, all programming assignments in this class are to be done individually. You are encouraged to help one another in understanding the concepts and principles needed to do the homework assignments for this class. Copying any part of other people's code, solution sets, or from any other sources (e.g., the Web) is strictly prohibited.

Academic dishonesty will not be tolerated. Appropriate disciplinary action will definitely be pursued. If necessary, please consult Policy 2490 of FIT's Student Handbook to inform yourself of what constitutes academic dishonesty. Furthermore, in the aforementioned policy, please ensure that you are cognizant of what constitutes plagiarism. With regards to CSE4001, my policy is the following: (a) First instance: 0 in the assignment, (b) Second instance: F in the course.

8 Late policy for assignments

Late submission assignments will not be graded. Sufficient time will be allocated for completion of assignments. It is the student's responsibility to complete and submission assignments on time.

9 What is Title IX?

Title IX of the Educational Amendments Act of 1972 is the federal law prohibiting discrimination based on sex under any education program and/or activity operated by an institution receiving and/or benefiting from federal financial assistance.

Behaviors that can be considered "sexual discrimination" include sexual assault, sexual harassment, stalking, relationship abuse (e.g., dating violence and domestic violence), sexual misconduct, and gender discrimination. You are encouraged to report these behaviors.

Reporting: Florida Tech can better support students in trouble if we know about what is happening. Reporting also helps us to identify patterns that might arise – for example, if more than one complainant reports having been assaulted or harassed by the same individual. Florida Tech is committed to providing a safe and positive learning experience. To report a violation of sexual misconduct or gender discrimination, please contact Security at 321-674-8111. * Please note that as your professor, I am required to report any incidences to Security or to the Title IX Coordinator (321-674-8700). For confidential reporting, please contact CAPS at 321-674-8050.

10 Syllabus change policy

This syllabus is subject to change according to the University policy

11 Schedule of evaluations

Assignments

The following is a list of the assignments (mostly programming) to be completed in this class. However, a few more assignments night be added during the course of the semester.

1. **Working with OS/161**: In this assignment, students will study OS/161 to answer some questions about the code and OS's structure. Students will also perform some debugging tasks using gdb.
2. **Implementing system calls**: Students will implement systems calls for OS/161.
3. **Using the process API in Linux**: Students will implement programs that use the Process API.
4. **Implement OS/161's process API**: Students will work on the implementation of the process API of OS/161.
5. **Implement a scheduler for OS/161**: OS/161 runs a basic round-robin scheduler. In this assignment, students will implement another scheduler for OS/161.
6. **Memory API**: Students will write a few programs that use the memory API in Linux.
7. **Multithread synchronization**: Students will write solutions to synchronization problems.
8. **Virtual memory in OS/161**: Students will work on the implementation of virtual memory in OS/161.

Exams

1. **Exam 1 (February 6)**: OS Structure, System Calls and Interrupts, Processes, OS/161.
2. **Exam 2 (March 13)**: Threads, Thread synchronization, CPU Scheduling, OS/161.
3. **Exam 3 (April 17)**: Memory and Virtual Memory, OS/161.
4. **Final Exam (Monday, April 30, from 3:30pm to 5:30pm)**: Everything. Students who achieve an overall grade $\geq 95\%$ (i.e., assignments+exams+quizzes before the final exam) will be exempted from the final exam.