

CprE 308: Operating Systems, Principles and Practice

Spring 2019

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Course Description:

This course is an introduction to the basic principles underlying current operating systems. Operating systems have evolved over a few decades and have led to a few well accepted abstractions. We will study those concepts and how they fit together: the purpose of an operating system, processes and threads, synchronization between multiple processes, process scheduling, deadlocks, the address space concept, virtual memory, file systems, I/O systems, security, and the basics of networking. The corresponding (weekly) Linux labs cover the "practice" portion of the class, where the students are required to write programs which interact with the operating system, and implement simplified versions of some of the OS modules. The labs require a knowledge of the C programming language and a working knowledge of the Linux operating system, which is introduced in the first lab.

Prerequisite:

CPR E 381 (CPTR ORG & ASMB PROG) or COM S 321 (INTR CPTR ARCH & MACH)

Course Materials:

Required Textbook:

- The required text for the course is Modern Operating Systems by Andrew S. Tanenbaum, 4th Edition, (ISBN 9780133591620).

References:

- A History of Unix
- Getting started, good reference for basic commands (ls, mkdir)
[http : //www.cs.wayne.edu/labPages/UnixT/start.html](http://www.cs.wayne.edu/labPages/UnixT/start.html)
- Another basic Unix tutorial, also has information on redirecting output (pipes)
[http : //www.ee.surrey.ac.uk/Teaching/Unix/](http://www.ee.surrey.ac.uk/Teaching/Unix/)
- Information on Unix System Calls, mostly uses info from man pages, but still useful
[http : //www2.cs.uregina.ca/~hamilton/courses/330/notes/unix/unix.html](http://www2.cs.uregina.ca/~hamilton/courses/330/notes/unix/unix.html)
- List of System Calls, good information but not well organized
[http : //www.softpanorama.org/Internals/unix_system_calls_links.shtml](http://www.softpanorama.org/Internals/unix_system_calls_links.shtml)
- Unix system calls and processes, fork(), exec() and wait()
[http : //www.scit.wlv.ac.uk/~jphb/spos/notes/processes.html](http://www.scit.wlv.ac.uk/~jphb/spos/notes/processes.html)
- Unix process management
[http : //heather.cs.ucdavis.edu/~matloff/UnixAndC/Unix/Processes.html](http://heather.cs.ucdavis.edu/~matloff/UnixAndC/Unix/Processes.html)
- Posix thread programming
[http : //www.llnl.gov/computing/tutorials/workshops/workshop/pthreads/MAIN.html](http://www.llnl.gov/computing/tutorials/workshops/workshop/pthreads/MAIN.html)
- List of signals and their numbers
[http : //linux.about.com/library/cmd/blcmdl7_signal.htm](http://linux.about.com/library/cmd/blcmdl7_signal.htm)
- Beej's Guide to Unix Interprocess Communication
[http : //www.ecst.csuchico.edu/~beej/guide/ipc/](http://www.ecst.csuchico.edu/~beej/guide/ipc/)
- Shared Memory, Semaphores, and Message Queues
[http : //www.princeton.edu/~psg/unix/Solaris/troubleshoot/ipc.html](http://www.princeton.edu/~psg/unix/Solaris/troubleshoot/ipc.html)

In addition, we will use some materials from the papers published recently. For those topics not covered in the textbook, we will post some papers in the reading list as required readings.

Course Outline:

In this course, we will study some of the most important materials in OSES including operating system concepts, processes, threads, synchronization between threads, process and thread scheduling, deadlocks, memory management, file systems, I/O systems, security, Linux-based lab experiments. Please find more details about the course schedule in Canvas.

Grading: The total point is 100 and will be based on the following grading criteria. The grading breakup will be as follows:

- 1) Weekly labs: 25%
- 2) Two programming projects: 10% (5% each)

- 3) Homework will not be graded, but there will be in-class quiz based on homework, and these quizzes make up 20% of the grade.
- 4) Two mid-term exams: 20%
- 5) Final Exam: 25%
- 6) Class Attendance (as bonus points): 3%

Current grades can be checked using Canvas.

Labs and Lectures

Attendance in the lectures is expected, and we welcome active participation.

Lab attendance is compulsory (there is credit for attendance). Lab reports are due the week after the lab, unless otherwise stated.

Late-Submission Policy

All the submission deadlines will be firm. But for the whole semester, you will have at most one time three-day no-reason extension.

Academic Integrity All your work (including the labs) should be done individually unless otherwise specified. You are not allowed to use work done by others, or obtain the answers directly in any form (such as from the web). If you have any questions about what is allowed/not allowed, please contact the instructor or the TAs.

Any cases of cheating will be dealt with the strictest possible measures allowed by the university, please refer to the university policies on academic dishonesty.

Lab Safety Policy

All personnel (faculty, staff, students, and visitors) who use laboratory facilities at Iowa State University shall follow the procedures detailed in the ISU Laboratory Safety Manual. Successful completion of appropriate safety training as specified in Safety Training Curriculum for Laboratory Personnel is required prior to beginning work in a laboratory. Please follow the link below to find more info:

<https://www.ece.iastate.edu/the-department/safety/>

Regarding accommodations for students with disabilities

If you have a disability and require accommodations, please contact the instructor early in the semester so that your learning needs may be appropriately met. You will need to provide documentation of your disability to the Disability Resources (DR) office, located on the main floor of the Student Services Building, Room 1076, 515-294-7220.

Office Hours: Tuesday 11:00-11:59am. You are welcome to stop by my office (Durham 309) any time you see I am in the office.