Operating Systems (OS, CS 273), Fall 2019
Syllabus

General information

- Instructor: Dick Brown (rab@stolaf.edu), office RMS 407, phone x3860
- Class meetings: RNS 203, MWF 2:00-2:55pm
- Office hours: T 12:00-1:30pm, W 3:15-4:15pm, Th 9-10:30am, F 3:15-4:15pm
- Text: Tanenbaum, *Modern Operating Systems,* 4th ed.
- Course Moodle site
- Piazza site: http://www.stolaf.edu/people/rab/os/piazza
  - This online forum resource enables students, TAs, and Prof. Brown to collaborate on posting and responding to questions for this specific offering of OS.
- Final exam: Wednesday, December 18, 2019, 2-4pm (Regular meeting room)

Intended outcomes from CS 273

At the end of CS 273, *Operating Systems (OS)*, we intend that students have:
- Conceptual understanding of each of the four essential service areas of a modern computer operating system, namely processes, memory management, device management, and file systems;
- Hands-on experience with each of those essential service areas, primarily through C programming on the Linux operating system;
- Exposure to representative design choices and kernel implementation of each of those service areas in the case of Linux, and awareness of selected differences in the case of Windows and other operating systems;
- Principles of computer security and protection mechanisms, with examples drawn primarily from the operating-systems level;
- Experience with configuring and using virtual machines;
- Introduction to systems programming, through projects to implement a shell (command-line interpreter) and a partial multithreaded web server;
- Conceptual understanding of deadlock, and strategies for avoiding and preventing it; and
- Kernel recompilation, structure, and modification, experienced through a kernel-programming project.

General statements

Statement of inclusivity

In keeping with St. Olaf College's mission statement, this class strives to be an inclusive learning community, respecting those of differing backgrounds and beliefs. As a community, we aim to be respectful to all citizens in this class, regardless of race, ethnicity, religion, gender or sexual orientation.

Accommodations

I am committed to supporting the learning of all students in my class. If you have already registered with Disability and Access (DAC) and have your letter of accommodations, please meet with me early in the course to discuss, plan, and implement your accommodations in the course. If you have or think you have a disability (learning, sensory, physical, chronic health, mental health or attentional), please contact Disability and Access staff to discuss possible accommodations. More information can be found by visiting https://wp.stolaf.edu/academic-support/dac.

Plagiarism and Academic Integrity

Plagiarism, the unacknowledged appropriation of another person's words or ideas, is a serious academic offense. It is imperative that you hand in work that is your own, and that cites or gives credit to others whenever you draw from their work. Please see St. Olaf's statements on academic integrity and plagiarism. See also the description of St. Olaf's honor system.

Grading policies

Criteria:

20%	Homework
25%	Quizzes
30%	Programming projects
25%	Final exam

- **Homework assignments** will be made once or twice per week. You will receive 100% credit on a homework or lab assignment if it is turned in complete and on time, even if there are a few mistakes. Late complete assignments are accepted for one week and will receive 70% credit. You are expected to receive at least ~~85%~~ **75%** of the total homework credit.
- Biweekly **quizzes** will be given during the term. Grade borderlines and individual cumulative quiz grade will be provided for each quiz. I will drop your lowest quiz grade at the end of the term, after normalizing to 87.5% for (lowest) A, 75% for B, 62.5% for C, 50% for passing. Makeup quizzes should be pre-arranged and taken in advance.
- Three **programming projects** will be assigned. Specifications for these projects will be provided later. Grade borderlines and individual cumulative project grade will be provided for each project. Project grades set at 87.5% for (lowest) A, 75% for B, 62.5% for C, 50% for passing.
- The **final exam** will be comprehensive. Final grades are normalized to 87.5% for (lowest) A, 75% for B, 62.5% for C, 50% for passing. A practice final with answers will be distributed for study near the end of the course.

Daily plan

Date	Reading	Topic	Homework	Quizzes, Projects
Fri 9-6	Chap 1	Intro; OS structures; Lab 1: introduction to C language		
Mon 9-9	Chap10	UNIX system calls.	HW1 due	
Wed 9-11		Lab 2: More on C language	HW2 due	
Fri 9-13		UNIX process diagrams		Shell project assigned
Mon 9-16		UNIX system calls, contin.	HW3 due	
Wed 9-18	2.1-2.2	Processes, threads		Q1
Fri 9-20		Race conditions.	HW4 due	
Mon 9-23	2.3	IPC strategies.		
Wed 9-25		IPC strategies, contin.	HW5 due (proj deliverable)	
Fri 9-27		Programming with threads.		
Mon 9-30		IPC strategies, contin.	HW6 due	
Wed 10-2		Thread-safe data structures.		Q2
Fri 10-4		Virtual machine lab	HW7 due	
Mon 10-7	2.4	Process scheduling.		Shell project due
Wed 10-9		Systems programming	HW8 due	Threads project assigned
Fri 10-11	3.1-3.2	Memory management; swapping.		
Mon 10-14		*Fall Break*		
Wed 10-16		System management lab		
Fri 10-18	3.3-3.4	Virtual memory; page replacement algorithms.		Q3
Mon 10-21	3.5-3.6	Issues in paging systems.		
Wed 10-23	3.7	Segmentation	HW9 due	
Fri 10-25		Implementation of memory management	HW10 due (proj deliverable)	
Mon 10-28	4.1-4.2	Files, directories.		
Wed 10-30	4.3-4.5	File systems.		Q4
Fri 11-1		Implementation of file systems	HW11 due	
Mon 11-4		Recompiling the kernel lab		
Wed 11-6		Implementation of Linux system calls; adding a system call to Linux		Kernel project assigned

Fri 11-8		Project support		Threads project due
Mon 11-11	5.1-5.3	I/O hardware and software.		
Wed 11-13	5.4-5.6	I/O devices: disks, clocks, terminals	HW12 due (proj deliverable)	
Fri 11-15		(cancelled)		
Mon 11-18		(quiz only)	HW13 due	Q5
Wed 11-20		Implementation of I/O		
Fri 11-22	6.1-6.4	Deadlock introduction, detect/recover	HW14 due (proj deliverable)	
Mon 11-25	6.5-6.7	Deadlock avoid, prevent; related issues	HW15 due	
Wed 11-27		*Thanksgiving*		
Fri 11-29		*Thanksgiving*		
Mon 12-2	9.1-9.4	Security basics; protection		practice final provided
Wed 12-4	9.5-9.9	Authentication, cryptography, security attacks		Q6
Fri 12-6		Project support	HW16 due	
Mon 12-9		Project support		Kernel project due
Wed 12-11		Review		practice final answers

Practice final exam answers