CS 452/552: Operating Systems

Instructor

Instructor:	Jim Buffenbarger
Office:	CCP-359
Email:	buff@cs.boisestate.edu
Phone:	208-426-3567
WWW:	http://csweb.boisestate.edu/~buff

Meetings

Lectures:	TuTh 3:00–4:15	CCP-259
Office hours:	TuTh 2:00–3:00	CCP-359
	by appointment	CCP-359

For BSU COVID-19 Information, please see:

http://csweb.boisestate.edu/~buff/files/covid.pdf

Our Teaching Assistant is Arif Ahmed:

arifahmed@u.boisestate.edu

I am happy to answer questions by email. Please see:

http://csweb.boisestate.edu/~buff/files/EmailQuestions.pdf
pub/doc/EmailQuestions.pdf

Catalog Description

Operating systems structure and design. Process management, concurrency and synchronization, interprocess communication, scheduling, device management, memory management, file systems and security. Case studies of multiple operating systems.

PREREQ: CS 230, CS 253, CS 321, ECE 330, and CS-HU 250.

Goals

Students are introduced to basic concepts of operating systems, including:

- using processes and threads
- operating system organization
- computer organization
- device management
- implementing processes and threads
- scheduling
- synchronization
- interprocess communication
- deadlock
- memory management
- virtual memory
- file management
- security
- networks

Textbook and Other Resources

The textbook is:

- *Operating Systems: Three Easy Pieces*, by A. Arpaci-Dusseau and R. Arpaci-Dusseau. 2018. https://pages.cs.wisc.edu/~remzi/OSTEP

Other Course Material

This syllabus, lecture slides, assignments, and other material is available in what we'll called our "pub" directory, on our Computer Science Lab (CCP-240, CCP-241, and CCP-242) computers, served by onyx.boisestate.edu. The directory is at:

```
~jbuffenb/classes/452/pub
```

This directory is read-only. So, you might want to copy it, perhaps to your local computer. Since `onyx` services Secure Shell (SSH) requests, you can use SSH clients (e.g., `scp` and `sftp`) to do so. However, beware: It contains symbolic links to parent directories, and `scp -r` will unconditionally follow them, thereby looping forever. To avoid this, use `sftp` or `tar`/`ssh`, as needed.

On our Canvas website, a copy of this directory can be accessed via the "Files" tab on the left sidebar. This copy is updated less frequently, since bulk upload is slow. Furthermore, although lecture slides can be viewed, the Canvas PDF viewer will not follow links to other files.

Office hours for our Teaching Assistants are at:

```
onyx:~jbuffenb/classes/452/pub/TutorOfficeHours
```

You may also find the following local guide useful:

```
onyx:~jbuffenb/classes/452/pub/etc/cs-linux.pdf
```

In particular, it explains how to use SSH.

Grading

At the end of the course, a letter grade is assigned to each student according to rank among classmates, which is determined from numerical scores assigned for performance of these activities:

Activity	Weight
Homework	80%
Exam	10%
Final	10%

Homework is due at 11:59PM, Mountain Time, on the day it is due. Late work is not accepted. To submit your solution to an assignment, login to a lab computer, change to the directory containing the files you want to submit, and execute:

```
submit jbuffenb class assignment
```

For example:

```
submit jbuffenb cs101 hw1
```

The `submit` program has a nice `man` page.

When you submit a program, include: the source code, sample input data, and its corresponding results.

Scores are posted in our `pub/scores` directory, as they become available. You will receive a code, by email, indicating your row in the score sheet. You are encouraged to check your scores to ensure they are recorded properly. If you feel that a grading mistake has been made, contact me as soon as possible.

Homework

Several homework problems are assigned during the semester. Each asks you to develop software of stunning elegance and beauty. Let's call it Handsomeware:

1. Queue<Anon>

2. Whack-a-Mole
     and
   Race Conditions

3. Execution Integrity

4. Driversity

5. Memory Hole

Exam and Final

An exam and a final are administered. These are in-class, open-note, and open-textbook (but no other books) tests. Of course, students work on these individually.

Attendance

In-person lecture attendance is an important part of course participation. Attendance is taken at each lecture: starting five minutes before the scheduled start time, and ending fifteen minutes after the scheduled start time. Attendance is not taken during the first week of classes, holidays, or finals week.

Attendance can affect your grade. Each absence results in a one-percent reduction of your overall course score. Since a few absences are expected, completion of BSU's on-line end-of-semester course evaluation will erase up to five absences.

Attendance is administered wirelessly, via the iClicker app, available for free, from your smartphone's app store. For more information, see:

```
http://boisestate.atlassian.net/
    wiki/spaces/LTS/pages/11436088/iClicker
```

Source-Code Documentation

Good documentation and programming style is very important. Your programs must demonstrate these qualities for full credit. Good documentation and programming style includes:

- heading comments giving: author, date, class, and description
- function/procedure comments giving description of: purpose, parameters, and return value
- other comments where clarification of source code is needed
- proper and consistent indentation
- proper structure and modularity

For more information, and examples, see:

www.cs.swarthmore.edu/~newhall/unixhelp/c_codestyle.html

Academic Integrity

The University's goal is to foster an intellectual atmosphere that produces educated, literate people. Because cheating and plagiarism are at odds with that goal, those actions shall not be tolerated in any form. Academic dishonesty includes assisting a student to cheat, plagiarize, or commit any act of academic dishonesty. Plagiarism occurs when a person tries to represent another person's work as his or her own or borrows directly from another person's work without proper documentation.

If a student engages in academic dishonesty, the student may be dismissed from the class and may receive a failing grade. Other penalties may include suspension or expulsion from the University.

Much more information about academic integrity, including examples of academic dishonesty, is at:

http://cs.boisestate.edu/~buff/files/www-integrity.pdf

If you are unsure about a particular behavior, ask your instructor.

Labs and Safety

Each student receives an account on the cluster of computers in the Computer Science Labs: CCP-240, CCP-241, and CCP-242. The cluster comprises a server named onyx.boisestate.edu and a set of nodes with shared home directories. It is remotely accessible, via SSH. The cluster runs the Linux and Windows operating systems, via VMware.

Physical access requires building and room access. After-hours building access, and all-hours room access, require an authenticated proximity-type student-identification card.

You are responsible for understanding and obeying lab rules:

https://www.boisestate.edu/coen-its/labs/lab-rules/

Schedule

Week	Date	Topic	Assigned	Due	Reading
1	Jan 10 Tue	Introduction			1-2
	Jan 12 Thu	Processes and Processors			3-11
2	Jan 17 Tue		HW1		
	Jan 19 Thu				
3	Jan 24 Tue				
	Jan 26 Thu			HW1	
4	Jan 31 Tue		HW2		
	Feb 02 Thu				
5	Feb 07 Tue	Concurrency			25-34
	Feb 09 Thu				
6	Feb 14 Tue				
	Feb 16 Thu				
7	Feb 21 Tue				
	Feb 23 Thu			HW2	
8	Feb 28 Tue	Exam			
	Mar 02 Thu		HW3		
9	Mar 07 Tue				
	Mar 09 Thu				
10	Mar 14 Tue	Input/Output Devices			35-42
	Mar 16 Thu				
11	Mar 21 Tue	Spring Break			
	Mar 23 Thu	Spring Break			
12	Mar 28 Tue				
	Mar 30 Thu		HW4	HW3	
13	Apr 04 Tue				
	Apr 06 Thu				
14	Apr 11 Tue				
	Apr 13 Thu				
15	Apr 18 Tue	Memory	HW5	HW4	12-24
	Apr 20 Thu				
16	Apr 25 Tue				
	Apr 27 Thu			HW5	
17	May 04 Thu	Final: 12:00-2:00			