CSCI 475: Operating Systems
Course Syllabus – Spring 2017

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Office Hours: [TBD], open door, or by appointment

Meeting Times: MWF 3-3:50 in TH 409
Course Page: http://cs.pugetsound.edu/~dchiu/cs475
Slack: http://univpugetsound.slack.com (signup with your pugetsound.edu address)
Moodle: http://moodle.pugetsound.edu

1 Course Information

Among the most complex software ever written, the modern operating system is the abstraction between
the human and the machine. This course traces how the simple idea of “resource sharing” unravels into
some of the most confounding problems and original breakthroughs in computer science. Course topics
include process and thread management, input/output, CPU scheduling, parallel processing, synchronization
mechanisms, memory management, and filesystems. Students taking this course will learn the intricacies of
low-level programming, parallel computing, and will also receive kernel-development experience through
the design and implementation of various data structures and subsystems in a real operating system. The C
programming language will be used for homework assignments and projects.

Prerequisites
A grade of C- or higher in the following course(s) is required:

- CSCI 281 - Assembly Language and Computer Architecture

Textbook

- Silberschatz, Galvin, and Gagne. Operating Systems Concepts. 8th Ed. or greater. (Required)
- Kernighan and Ritchie. The C Programming Language. 2nd Ed. (Supplemental)
- D. Comer. Operating System Design – The XINU Approach. 2nd Ed. (Supplemental)

Course Topics

- The history and current state of computer systems
- Process management
- Threads
- Interrupts and system calls
- CPU scheduling
- Synchronization of concurrent programs
• Memory management and virtual memory
• Disk scheduling and filesystems

2 Course Outcomes

Students taking this course will:

• Be proficient in the C programming language.
• Be proficient in the use of the Linux environment for coding, compilation, debugging, and testing.
• Design and implement concurrent programs using proper synchronization techniques.
• Evaluate the merits and downfalls of various CPU scheduling, memory management, and deadlock handling policies.
• Gain experience designing and implementing key components in a real OS kernel, including a ready queue, a robust CPU scheduler, synchronization mechanisms, and deadlock detection & recovery.

3 Grading

The following grade cutoffs are upper bounds - they might come down, but will not be set higher: A = 95, A- = 90, B+ = 87, B = 83, B- = 80, C+ = 77, C = 73, C- = 70, D+ = 67, D = 64, D- = 60, F = < 60. Your overall grade will be composed as follows:

<table>
<thead>
<tr>
<th></th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discretionary</td>
<td>5</td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>35</td>
</tr>
<tr>
<td>Programming Projects</td>
<td>20</td>
</tr>
<tr>
<td>Midterm I</td>
<td>10</td>
</tr>
<tr>
<td>Midterm II</td>
<td>13</td>
</tr>
<tr>
<td>Final Exam</td>
<td>17</td>
</tr>
</tbody>
</table>

Table 1: Breakdown of Grades

3.1 Assignments

• Homework Assignments (Work Alone!) – You will work alone on all homework assignments. Collaboration among students is encouraged for problem interpretation, brainstorming, etc., but in general, I expect every student to submit their own work. Do not help write or share each other’s programs! Duplications are easy to catch, and the penalty for cheating is severe: course failure.

• Projects – Paired-programming is required for the Xinu projects. Random pairs of students will be assigned per assignment. Your source code should conform to good programming style and documentation.

• Late Work – For each day either a homework or project assignment is late (includes weekends), a 10% deduction will be assessed, and no late work will be accepted after one week past the due date.
3.2 Exams

There will be two midterms and a final exam. The final exam will be cumulative. They will cover material discussed in readings, lectures, projects, and assignments.

3.3 Discretionary

Discretionary points will be given based on your...

- Attendance
- Class participation
- Refrain from activities that can disrupt others, e.g., texting, playing games on your laptop, etc.

4 Policies

Class Disruptions

I understand the student's need to have their phone on them to answer the occasional important call. I do ask that you please have your phones on vibrate and take the call outside the classroom out of respect for your fellow students.

Academic Integrity

You should be aware of the Student Integrity Code at the university. Any suspected cheating (e.g., plagiarizing code, copying homework solutions, etc.) will be reported to the Registrar, which may result in possible suspension/expulsion. See this link for more info:

Student Accessibility and Accommodation

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Peggy Perno, Director of the Office of Accessibility and Accommodation, 105 Howarth, 253.879.3395. She will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Classroom Emergency Response Guidance

Please review university emergency preparedness and response procedures posted at . There is a link on the university home page. Familiarize yourself with hall exit doors and the designated gathering area for your class and laboratory buildings.

If building evacuation becomes necessary (e.g. earthquake), meet your instructor at the designated gathering area so she/he can account for your presence. Then wait for further instructions. Do not return to the building or classroom until advised by a university emergency response representative.

If confronted by an act of violence, be prepared to make quick decisions to protect your safety. Flee the area by running away from the source of danger if you can safely do so. If this is not possible, shelter in place by securing classroom or lab doors and windows, closing blinds, and turning off room lights. Lie on the floor out of sight and away from windows and doors. Place cell phones or pagers on vibrate so that you can receive messages quietly. Wait for further instructions.
Student Bereavement Policy

The University of Puget Sound recognizes that a time of bereavement can be difficult for a student. Therefore, the university provides a Student Bereavement Policy for students facing the loss of a family member. Students are normally eligible for, and faculty members are expected to grant, three consecutive weekdays of excused absences, without penalty, for the death of a family member, including parent, grandparent, sibling, or persons living in the same household. Should the student feel that additional days are necessary, the student must request additional bereavement leave from the Dean of Students or the Dean’s designee. In the event of the death of another family member or friend not explicitly included within this policy, a bereaved student may petition for grief absence through the Dean of Students office for approval.

5 Course Schedule

The following course schedule is tentative and subject to change.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course overview, computer system history and trends</td>
<td>Silberschatz, et al.: Chap 1</td>
</tr>
<tr>
<td>2</td>
<td>Interrupts, traps, and dual-mode operation</td>
<td>Silberschatz, et al.: Chap 2</td>
</tr>
<tr>
<td>3</td>
<td>Process management</td>
<td>Silberschatz, et al.: Chap 3</td>
</tr>
<tr>
<td>4</td>
<td>Threads and parallel processing</td>
<td>Silberschatz, et al.: Chap 4</td>
</tr>
<tr>
<td>5</td>
<td>CPU scheduling</td>
<td>Silberschatz, et al.: Chap 6</td>
</tr>
<tr>
<td>6</td>
<td>Review and Midterm I</td>
<td>Silberschatz, et al.: Chap 5</td>
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<tr>
<td>7</td>
<td>Synchronization: critical section problem, atomicity, locks</td>
<td>Silberschatz, et al.: Chap 5</td>
</tr>
<tr>
<td>8</td>
<td>Synchronization: semaphores</td>
<td>Silberschatz, et al.: Chap 5</td>
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<td></td>
<td>Spring Break</td>
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<tr>
<td>9</td>
<td>Synchronization: monitors and condition variables</td>
<td>Silberschatz, et al.: Chap 5</td>
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<td>10</td>
<td>Deadlocks: avoidance, allocation graphs, detection, recovery</td>
<td>Silberschatz, et al.: Chap 7</td>
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<td>11</td>
<td>Review and Midterm II</td>
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<tr>
<td>12</td>
<td>Memory management: partitioning, segmentation, and paging</td>
<td>Silberschatz, et al.: Chap 8</td>
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<tr>
<td>13</td>
<td>Memory management (cont.), virtual memory</td>
<td>Silberschatz, et al.: Chap 9</td>
</tr>
<tr>
<td>14</td>
<td>Disk scheduling and filesystems</td>
<td>Silberschatz, et al.: Chap 12</td>
</tr>
<tr>
<td>15</td>
<td>Review and reading period</td>
<td>—</td>
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</tbody>
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