

CMPSC 440
Operating Systems
Spring 2014
Syllabus

Course Instructor

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Instructor's Office Hours

- Monday: 4:30 pm – 5:30 pm (15 minute time slots)
- Wednesday: 1:00 pm – 4:00 pm (15 minute time slots)
- Thursday: 1:00 pm – 3:00 pm (15 minute time slots)
- Friday: 9:00 – 10:00 am (10 minute time slots) *and*
1:00 pm – 2:00 pm (5 minute time slots)

To schedule a meeting with me during my office hours, please visit my Web site and click the “Schedule” link in the top right-hand corner. Now, you can browse my office hours or schedule an appointment by clicking the correct link and then reserving an open time slot. From 3:30 – 4:30 pm on Tuesdays, I also will be available for walk-in technical consultations in Alden Hall 101.

Course Meeting Schedule

Lecture, Discussion, and Group Work: Tuesday, Thursday, 11:00 am – 12:15 pm
Laboratory Session: Monday, 2:30 pm – 4:20 pm
Final Examination: Thursday, May 1, 2014 at 7:00 pm

Course Catalogue Description

A study of operating systems and their design and implementation. Topics include the evolution of modern computer operating systems, basic components of an operating system, and hardware issues of importance to operating system design and implementation. Consideration is given to processes and threads, resource (processor, memory, device, and software) management, process and device scheduling, deadlocks, input/output, file systems, and system security. A representative operating system is examined in detail. One laboratory per week. Prerequisite: Computer Science 210.

Course Objectives

The design, implementation, and use of operating systems involves the application of many interesting theories, techniques, methodologies, and tools. This course has the objective to:

1. Provide an overview of the nature and functions of operating systems.
2. Study the relationship between computer hardware and operating systems.
3. Enhance the understanding of the services that operating systems provide to users.
4. Explore fundamental operating system concepts (e.g., processes, address spaces, and files).
5. Study the algorithms in operating systems (e.g., memory management and scheduling).
6. Examine, in detail, the design of the important modules in an operating system.
7. Develop a “big picture” understanding of the overall design of an operating system.
8. Provide an introduction to multi-processor systems and distributed systems.
9. Develop a basic understanding of security and protection issues in operating systems.
10. Enhance knowledge of the Linux operating system and its associated tools.

Throughout the semester students also will enhance their ability to write and present ideas about operating systems in a clear and compelling fashion. Students will gain practical experience in the design, implementation, and analysis of operating systems during laboratory sessions and a final project. Finally, students will develop a richer understanding of the fascinating connections between operating systems and other disciplines in the social and natural sciences and the humanities.

Required Textbook

Modern Operating Systems. Andrew S. Tanenbaum. Third Edition, ISBN-10: 0136006639, ISBN-13: 978-0136006633, 1104 pages, 2007.

(References to the textbook are abbreviated as “MOS” on the course Web site).

Students who want to improve their technical writing skills may consult the following books.

BUGS in Writing: A Guide to Debugging Your Prose. Lyn Dupré. Second Edition, ISBN-10: 020137921X, ISBN-13: 978-0201379211, 704 pages, 1998.

Writing for Computer Science. Justin Zobel. Second Edition, ISBN-10: 1852338024, ISBN-13: 978-1852338022, 270 pages, 2004.

Along with reading the required textbook, you will be asked to study additional articles from a wide variety of conference proceedings, journals, and the popular press.

Class Policies

Grading

The grade that a student receives in this class will be based on the following categories. All percentages are approximate and, if the need to do so presents itself, it is possible for the assigned percentages to change during the academic semester.

Class Participation and Instructor Meetings	5%
First Examination	15%
Second Examination	15%
Final Examination	20%
Laboratory Assignments	30%
Final Project	15%

These grading categories have the following definitions:

- *Class Participation and Instructor Meetings:* All students are required to actively participate during all of the class sessions. Your participation will take forms such as answering questions about the required reading assignments, asking constructive questions of your group members, giving presentations, and leading a discussion session. Furthermore, all students are required to meet with the course instructor during office hours for a total of thirty minutes throughout the Spring 2014 semester. These meetings must be scheduled through the course instructor's reservation system and documented on a meeting record that you submit on the day of the final examination. A student will receive an interim and final grade for this category.
- *First and Second Examinations:* The first and second interim examinations will cover all of the material in their associated module(s). While the second examination is not cumulative, it will assume that a student has a basic understanding of the material that was the focus of the first examination. The date for the first and second examinations will be announced at least one week in advance of the scheduled date. Unless prior arrangements are made with the course instructor, all students will be expected to take these examinations on the scheduled date and complete the tests in the stated period of time.
- *Final Examination:* The final examination is a three-hour cumulative test. By enrolling in this course, students agree that, unless there are extenuating circumstances, they will take the final examination at the date and time stated on the first page of the syllabus.
- *Laboratory Assignments:* These assignments invite students to explore different techniques for designing, implementing, evaluating, and documenting software solutions to challenging problems in the field of operating systems. Many of the assignments will require students to write programs, conduct experiments, and collect, analyze, and write about data sets. To best ensure that students are ready to develop software in both other classes at Allegheny College and after graduation, students will complete assignments either on an individual basis or in teams. When teamwork is required, the instructor will assign individuals to teams.
- *Final Project:* This project will present you with the description of an operating systems problem and ask you to design and implement a correct and carefully evaluated solution. Completion of the final project will require you to apply all of the knowledge and skills that you have accumulated during the course of the semester to solve a problem and, whenever possible, make your solution and results publicly available in a free and open fashion.

Assignment Submission

All assignments will have a stated due date. The printed version of the assignment is to be turned in at the beginning of the class on that due date; the printed materials must be dated and signed with the Honor Code pledge of the student(s) completing the work. Late assignments will be accepted for up to one week past the assigned due date with a 15% penalty. All late assignments must be submitted at the beginning of the session that is scheduled one week after the due date. Unless special arrangements are made with the course instructor, no assignments will be accepted after the late deadline. For any assignment completed in a group, students also must turn in a one-page document that describes each group member's contribution to the submitted deliverables.

Attendance

It is mandatory for all students to attend all of the class and laboratory sessions. If you will not be able to attend a session, then please see the course instructor at least one week in advance to describe your situation. Students who miss more than five unexcused classes, laboratory sessions, or group project meetings will have their final grade in the course reduced by one letter grade. Students who miss more than ten of the aforementioned events will automatically fail the course.

Use of Laboratory Facilities

Throughout the semester, we will experiment with many different software tools that computer scientists use during the design, implementation, evaluation, and interaction with operating systems. The course instructor and the department's systems administrator have invested a considerable amount of time to ensure that our laboratories support the completion of both the laboratory assignments and the final project. To this end, students are required to complete all assignments and the final project while using the department's laboratory facilities. The course instructor and the systems administrator normally do not assist students in configuring their personal computers.

Class Preparation

In order to minimize confusion and maximize learning, students must invest time to prepare for the class discussions and lectures. During the class periods, the course instructor will often pose demanding questions that could require group discussion, the creation of a program or data set, a vote on a thought-provoking issue, or a group presentation. Only students who have prepared for class by reading the assigned material and reviewing the current assignments will be able to effectively participate in these discussions. More importantly, only prepared students will be able to acquire the knowledge and skills that are needed to be successful in both this course and the field of computer science. In order to help students remain organized and effectively prepare for classes, the course instructor will maintain a class schedule with reading assignments and presentation slides. During the class sessions students will also be required to download, use, and modify programs and data sets that are made available through the course Web site.

Email

Using your Allegheny College email address, I will sometimes send out class announcements about matters such as assignment clarifications or changes in the schedule. It is your responsibility to check your email at least once a day and to ensure that you can reliably send and receive emails. This class policy is based on the following statement in *The Compass*, the College's student handbook.

“The use of email is a primary method of communication on campus. . . . All students are provided with a campus email account and address while enrolled at Allegheny and are expected to check the account on a regular basis.”

Disability Services

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires all students with disabilities be guaranteed a learning environment that provides

for reasonable accommodation of their disabilities. Students with disabilities who believe they may need accommodations in this class are encouraged to contact Disability Services at 332-2898. Disability Services is part of the Learning Commons and is located in Pelletier Library. Please do this as soon as possible to ensure that approved accommodations are implemented in a timely fashion.

Honor Code

The Academic Honor Program that governs the entire academic program at Allegheny College is described in the Allegheny Course Catalogue. The Honor Program applies to all work that is submitted for academic credit or to meet non-credit requirements for graduation at Allegheny College. This includes all work assigned for this class (e.g., examinations, laboratory assignments, and the final project). All students who have enrolled in the College will work under the Honor Program. Each student who has matriculated at the College has acknowledged the following pledge:

I hereby recognize and pledge to fulfill my responsibilities, as defined in the Honor Code, and to maintain the integrity of both myself and the College community as a whole.

It is recognized that an important part of the learning process in any course, and particularly one in computer science, derives from thoughtful discussions with teachers and fellow students. Such dialogue is encouraged. However, it is necessary to distinguish carefully between the student who discusses the principles underlying a problem with others and the student who produces assignments that are identical to, or merely variations on, someone else's work. While it is acceptable for students in this class to discuss their programs, data sets, and reports with their classmates, deliverables that are nearly identical to the work of others will be taken as evidence of violating the Honor Code.

Welcome to an Adventure in Operating Systems

In reference to software, Frederick P. Brooks, Jr. wrote in chapter one of *The Mythical Man Month*, "The magic of myth and legend has come true in our time." Software is a pervasive aspect of our society that changes how we think and act. Moreover, the operating system is one of the crucial software components that enables people to interact with a wide range of servers, desktop workstations, and mobile and embedded devices. As such, efficient and correct operating systems have the potential to positively influence the lives many of people. Moreover, the design, implementation, evaluation, documentation, and use of operating are exciting and rewarding activities! At the start of this class, I invite you to pursue this adventure in operating systems with enthusiasm and vigor.