

CS-343 Operating Systems

Fall Quarter 2003

Syllabus and class information

Administrative Information

Professor

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TA

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Course Description

Operating systems control all of a computer's resources and present users with the equivalent of virtual machines that are easier to program than their underlying hardware. This course is an introduction to basic operating systems concepts including operating systems structures, processes and thread, memory management, and file systems.

The course assumes familiarity with basic computer organization and data structures. You will need to be able to program in C (or C++) in UNIX systems to perform most of the assignments.

Location and Time

Tuesdays and Thursdays 2:00-3:20.
Lectures will be held in 1890 Maple, Room 381.

Course Prerequisites

- Required: **CS-311 Data structures and data management**.
- Highly recommended: **CS-213 Introduction to Computer Systems** – taking this course will make your life a lot easier.
- Familiarity with basic computer architecture concepts and proficiency in C programming in UNIX systems.

Communication Channels

There are a number of communication channels set up for this class:

- We will use the course web site (<http://www.cs.northwestern.edu/~fabianb/cs-343-f03>) to post homeworks, projects, course-related announcements, etc. You should check this regularly.
- This year we will also be using the Northwestern's Blackboard System. The system includes a number of nice features such as an announcement board, group email, a place for assignment postings, and, more important to us, a discussion board. The Discussion Board is intended to foster communication among you, the students. You'll find that someone else in the class will have thought of the same problem that you have and will perhaps have some valuable insight that will prove helpful. The staff will be monitoring the discussion threads and will step in with guidance when appropriate.
- Finally, there is an email alias (`cs-343-ta@cs`) for the TA that you should use for questions that would be inappropriate to post on the newsgroup (source code being a good example).

Materials

Required

- *Modern Operating Systems, 2nd Ed.*, A. S. Tanenbaum, Prentice-Hall, Upper Saddle River, NJ, 2001. ("MOS" from now on.)
- Papers: A set of papers that will be made available.

Recommended

- *Advanced Programming in the Unix Environment*, R. Stevens, Addison-Wesley, 1992. A basic book for anyone writing programs that run under Unix.
- *The C Programming Language, 2nd Ed.*, B. W. Kernighan and D. M. Ritchie, Prentice Hall, 1988. A must.
- *The Practice of Programming*, Brian W. Kernighan and Rob Pike. Addison-Wesley, 1999. Programming is more than just writing code.

Exams

There will be a midterm and a final exam. Exams will be in-class, closed-book, and will cover materials from lecture, required readings and projects. The final exam will not be cumulative.

Homework

There will be two kinds of homework assignments given throughout the class: reading assignments and textbook-style questions. You should have finished the assigned reading before coming to lecture. In addition, there will be a set of written homeworks that must be done alone and turned in at the end of class on the due date (see course policies below).

Projects

As you can deduce from the allocation of weights for grading, programming projects make up a major portion of this class. There will be four (4) projects. Except for the first “warm-up” assignment that you will work by yourself, all other projects are to be done by teams of two (2) people. Both partners should work cooperatively on the design, implementation, and testing of their solution. You will have to choose different partners for different projects.

Grading

I will try very hard to give you the grade you deserve. I will use a criterion-referenced method; in other words, your grade will be based on how well you do relative to predetermined performance levels, instead of in comparison with the rest of the class. Thus, if a test has 100 possible points, anyone with a score of 90 or greater will get an A, those with scores of 80 or greater will get a B, those with scores of 70 or greater will get a C, and so on. Notice that this means that if everyone works hard and gets >90, everyone gets an A.

Total scores (between 0 and 100) will be determined, roughly, as follows:

- Homeworks: 10%
- Projects: 50%
- Exams (20% each): 40%

A note about *class participation*: while not explicitly included as an item in the previous list, your participation in class will be taken into consideration throughout the quarter and when granting partial and final scores/grades.

Course Outline and Approximate Dates

Because one has to be an optimist to begin an ambitious project, it is not surprising that underestimation of completion time is the norm.

– Fernando J. Corbató, “On Building Systems that Will Fail”, 1990 Turing Award Lecture.

Class	Date	Topic	Textbook/paper†
01	09/25	Introduction/logistics/Deep C	1.1-1.3
02	09/30	Deep C	
03	10/02	Architectural support for OS, OS components and structure	1.4-1.7
04	10/07	Processes and Threads	2.1-2.2
05	10/09	Processes and Threads	2.1-2.2
06	10/14	Interprocess communication (IPC) and synchronization	2.3-2.4
07	10/16	IPC, synchronization & scheduling	2.3-2.5
08	10/21	Scheduling	2.5
09	10/23	Deadlock and Review	3
10	10/28	Midterm	
11	10/30	Memory management	4.1-4.2
12	11/04	Virtual memory (VM)	4.3-4.5
13	11/06	VM Design and implementation issues	4.6-4.8
14	11/11	I/O Devices	5.1-5.7
15	11/13	File systems	6.1-6.3
16	11/18	FFS and LFS	papers
17	11/20	Networks and distributed systems	8.1-8.3.2
18	11/25	Distributed Systems Paradigms	8.3
19	11/27	Security	9
20	12/02	< <i>buffer</i> >	
21	12/04	Research in OS/Review	TBD
22	12/08	Final (7:00-9:00PM)	

Table 1: † Papers will be listed in the course webpage.

Policies

Late policy: Unless otherwise indicated, homeworks and projects are due by the end of lecture on their due date. If you hand in an assignment late, we will take off 10% for each day (or portion thereof) it is late.

Cheating vs. Collaboration: Collaboration is a really good thing and we encourage it. On the other hand, cheating is considered a very serious offense. When in doubt, remember that it’s OK to meet with colleagues, study exams together, and discuss assignments. However, what you turn in must be your own (or for group projects, your group’s own) work. Copying code, solution sets, etc. from other people or from any other sources is strictly prohibited.