

CSCE 351: Operating System Kernels

Lecture: Wednesday 3:20 – 5:20 & Friday 3:20 – 4:20 pm (19 Avery)

Lab: Monday 3:30 – 5:20 pm (20 and 21 Avery)

1 Contact Information

Instructor: Dr. Witawas Srisa-an

123E Avery Hall

Tel: 472-5004

Email: witty@cse.unl.edu

Hours: Wednesday 9:00 - 11:30 am.

Teaching Assistant: Yong Wang

TBD

Tel: TBD

Email: ywang@cse.unl.edu

Hours: TBD

2 Overview

The goal of this class is to familiarize students with the internal working of operating systems. An operating system is a software system that provides its users with a convenient interface. Typically, the source code of the operating system is compiled and linked into a single binary program. This program is referred to as the Kernel. Our objective in this class is to study the design and implementation of the kernels. The following topics will be discussed:

- History and overview of operating systems
- Process management
- Memory Management
- System calls
- Handling of interrupts and exceptions
- Low level hardware/software interface
- Race condition and critical sections
- I/O hardware and software
- Deadlock

3 Objectives

Upon the completion of this class, students are expected to be able to:

- clearly visualize the intricate relationship between an operating system and its underlying hardware.
- appreciate the complexity of operating system design. We will inspect the detailed implementation of threading and process management functions, system calls and interrupt handling mechanisms.
- design some of the core functions in an operating system. There will be lab exercises and class project that would focus on process management in Windows CE, hardware/software interface, and designing of a boot loader and system calls.

4 Materials

We have one official textbook and several documents that will be distributed on-line.

- *Operating Systems: Internal and Design Principles, 5th Edition* by William Stallings, Prentice Hall, 2004. (REQUIRED TEXT, available from the bookstore)

In addition, we will be using the following software for our projects:

- Microsoft Platform Builder 4.2 (can be downloaded from Microsoft Academic Alliance Web site).
- Microsoft Embedded Visual C++ 4.0 (can be downloaded from Microsoft Academic Alliance Web site).

The following books are also good references for our class.

- *The C Programming Language, ANSI C Edition*, by Kernighan and Ritchie, Prentice Hall, 1989 (Official optional but highly recommend).
- *Operating System Concepts, 6th Ed*, Silberchatz, Galvin, and Gagne, John Wiley and Sons, 2001 (Optional).
- *Modern Operating Systems, 2nd Edition*, Tenenbaum, Prentice-Hall, 2001 (Optional).

You should also browse through our on-line help and download course notes prior to each week. On-line help page is at:

www.cse.unl.edu/~witty/f2005/csce351/howto.html

Weekly lecture notes can be downloaded at:

www.cse.unl.edu/~witty/f2005/csce351/materials.html

5 Prerequisite

- CSCE 230 and CSCE 230L (Computer Organization) or CSCE 231—the basic concept of computer organization is very important in this class. You **must** be proficient with assembly programming and basic microprocessor datapath.
- CSCE 310 (Data Structures and Algorithms)—complex data structures are often used to maintain information in operating systems. Thus, a solid understanding of basic structures including single link-list, double link-list, hash table, multi-dimensional arrays, etc. is very important. In addition, a basic knowledge of pointer arithmetic is also useful.

6 Grading

Your final grade will be composed of:

1. Class participation (5%) - If you are active in class, active on the forum, or active outside of class, you can earn up to 5 points. Typically, it is difficult to clearly define the criteria for giving out points in class participation. In the past, I've used the following criteria to assign points:
 - common beginning—everyone begins the semester with three points.
 - familiarity with the students—if you are active in forum participation, make frequent visit during office hours, or/and actively participate in the classroom, you have earned 1 or 2 positive points.
 - absence of the students — if you are not present during random attendance check, do not pick up graded material, sleep in the class (trust me, I remember), you have earned 1 or 2 negative points.
 - different ending—you final score is based on the sum/difference of positive/negative points.
2. Assignments (45%) - Homework and lab 25%, and project 25%. The distribution within this category is still tentative.
3. Midterm examination (25%) - Will occur around week 8 or 9. It will focus on the main objective of the course which is in-depth understanding of concepts.
4. Final examination (25%) - during the final week, not comprehensive

Grading scale will be

A+ = 98 - 100+
A = 94 - 97.99
A- = 90 - 93.99
B+ = 87 - 89.99
B = 83 - 86.99
B- = 80 - 82.99
C+ = 77- 79.99

C = 73 - 76.99
C- = 70 - 72.99
D-, D, D+ = 60 - 69.99
F = Below 60

Note: Automatic two-business day extension will be granted in exchange for 30% reduction in that assignment score. To take this option, you need to send me an e-mail specifying that you will be late within 24 hours **AFTER** the deadline. I will not accept late assignment after the extended period. This precisely means that you will get **NO** credit for your work.

7 Ground Rules

Please note that by staying on the course you are abiding to the rules and regulations described below. These are non negotiable.

1. All work submitted has to be your own work. Cheating of any form (copying from someone, allowing someone to copy from you, presenting someone else's work as your own either partially or fully) will **guarantee FAILURE** in this course. In addition, your action will be reported to the Dept. Chairman. We **encourage** you to collaborate with your classmates on issues such as clarifying the problem statements, discussing potential solutions, discussing related tools and features needed for the assignments.
2. Project reports are due on a day we have a class up until the end of the lecture. Anything after that is considered late. If you decide to use the mailboxes in the CSE department then we are not liable if they are lost or stolen from the mailbox. It is your responsibility to get your report submitted. If you fail to do so you will receive no credit for it. Unless specified, your work should be submitted through *hand-in*.
3. For project assignments, instructions will be given accordingly.
4. No assignment will be accepted after the two-day extended period.
5. For the purpose of this course, you will have to download and install certain software packages. Help pages will be provided but you are expected to perform the task yourselves.
6. You are expected to be comfortable with the prerequisite material. If you are not, it is your responsibility to revise and prepare accordingly.

8 Special Needs

We will try to accomodate any student with a disability. Please contact the instructor as soon as possible if you need special accommodations.