

CSCE 351: Operating System Kernels  
Lecture: Monday and Wednesday 3:30 – 4:45pm (Avery 106)

## 1 Contact Information

**Instructor:** Dr. Ying Lu  
Schorr Center 104  
Tel: 472-5793  
Email: ylu@cse.unl.edu  
Hours: Monday and Wednesday 2:30 - 3:30pm and by appointment

**Homework Teaching Assistant:**  
Weiyue Xu  
Schorr Center 207  
Email: weiyue@cse.unl.edu  
Hour: Thursday 4:00-5:00pm at SRC (Avery 13A) and by appointment

**Project Teaching Assistant:**  
Dongyuan Zhan  
Schorr Center 218  
Tel: 770-8372  
Email: dzhan@cse.unl.edu  
Hour: Tuesday 4:00 - 5:00pm at SRC (Avery 13A) and by appointment

## 2 Overview

The goal of this class is to familiarize students with operating system internals. An *Operating System (OS)* is a software system that provides its users with convenient interfaces. 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 OS 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
- Deadlock
- I/O hardware and software (if time permitted)

## 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 class projects that would focus on process management in real-world operating systems, hardware/software interfaces, 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, 7th Edition* by William Stallings, Prentice Hall, 2010. (REQUIRED TEXT, available from the bookstore)

The following books are also good references for our class.

- *The C Programming Language, ANSI C Edition*, by Kernighan and Ritchie, Prentice Hall, 1989 (highly recommended).
- *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 course notes. On-line help page is at:

<http://www.cse.unl.edu/~ylu/csce351/howto.html>

Lecture notes can be downloaded at:

<http://www.cse.unl.edu/~ylu/csce351>

## 5 Prerequisite

- CSCE 230 (or CSCE 230H) and CSCE 230L (Computer Organization)—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 you can earn up to 5 points. Typically, it is difficult to clearly define the criteria for giving out points in class participation. I'll use the following criteria to assign points:
  - Everyone begins the semester with 2 points.
  - If you are active in the classroom discussion, you can earn up to 3 additional points.
  - If you are not present during random attendance check, do not pick up graded material, you may lose up to 2 points.

- During the lecture, please do not use laptop, iphone, or any device that pull your attention away from the class!
2. Assignments (60%) - Homework 20%, and projects 40%. The distribution within this category is still tentative. The final project will be due during the 15<sup>th</sup> week.
  3. Midterm examination (20%) - Will occur around week 8 or 9. It will focus on the main objective of the course which is in-depth understanding of the major concepts.
  4. Final examination (15%) - Will occur on Monday before Thanksgiving holiday, 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 day extension will be granted in exchange for a 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. This rule does not apply to the last project.

## 7 Ground Rules

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

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 assignments.
2. Project reports are due on at a specified time. 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 materials. If you are not, it is your responsibility to revise and prepare accordingly.

## 8 Special Needs

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