# 作業系統 Operating Systems (Spring 2024)

**by**

**Prof. 施吉昇 Daniel C.-S. Shih/巫芳璟 Fang-Jing Wu**

**Class website: https://cool.ntu.edu.tw/courses/33481**

The class meets on every **Tuesday from 9:10AM to 12:00PM at Room 102@CSIE (Section 01/Odd) and Room 104@CSIE (Section 02/even) building**.

**TAs:** 陳愷謙 (CHEN, KAI-CHIEN)-MP0 , 李子明 (LI, ZIH-MING)-MP1, 曾益銘 (CHIN YIK MING)-MP2, 許綾恩 (HSU, LING-EN)-MP2, 李浩銘 (LI HO MING)-MP3, 王一宇 (YI-YU WANG)-MP3, 游凱雯 (YU, KAI-WEN)-MP4, 許晉瑋 (HSU, JIN-WEI)-MP4

**Office Hour:**

Prof. Chi-Sheng Shih, 9 AM to 10:30 PM on every Friday at Rm. 523 or by appointment.
Prof. Fang-Jing Wu, TBA.

**Course Description:**

This course is designed for junior CS-major students and is an introductory system-level course. In this course, we will learn how the operating systems are designed and implemented. The following are the goals of this course.

**1. To be familiar with the architecture and design of operating systems**.
The course means to teach how modern operating systems are structured and how the major sub-systems in modern operating systems are designed and implemented. The students are expected to design and implement application/domain-specific operating systems at the end of the course.

**2. To become good system programmers.**
It means that you will have the capability of implementing an operating system for special purposes. The learning process that you will have in this course should teach you how a good operating system should be and how the design of the operating system may affect the performance of user applications. Hence, it will lead to the design and implementation of an operating system at small to mid-size.

At the end of the semester, you may want to go through this list again to see if the goals are met. We would appreciate it if you could provide us with your comments regarding the class at the end of the semester. (Well, you can send us your comments at any time. However, I guess it is more reasonable to review the class at the end of the semester.)

**Prerequisites:**

The students should be familiar with data structures, system programming, and basic C/C++ programming.

**Text Book:**

There is one required text book: *Operating system concepts* by "Galvin, Peter B., Greg Gagne, and Abraham Silberschatz, John Wiley and Sons, **ISBN** 978-1-118-06333-0. It is distributed by Ten-Long (天瓏圖書) in Taiwan. Other reference books, internet website will be available on the class website.

Optional reference book:

- "Xv6, a simple Unix-like teaching operating system" by R. Cox, M.F. Kaashoek, & R. Morris, 2011, *https://pdos.csail.mit.edu/6.S081/2020/xv6.html*.
- "Advanced Programming in the Unix Environment" third edition by W. Richard Stevens and Stephen A. Rago, Addison-Wesley, 2013. It is distributed by 開發圖書有限公司.
- *Understanding Unix/Linux Programming: A Guide to Theory and Practice*, Molay, Prentice Hall, ISBN: 0130083968

Lecture slides and handouts will be available on the class website. Please check out the slides and handouts before the class. The handouts will NOT be distributed in the class. Note that the lecture slides should NOT be the only materials for you to study. They only serve as a guideline for you to study other materials, including textbooks and online resources. You will likely fail the exam if you only study the lecture slides.

**Covered Topics:**

- Process
- Thread
- Memory Systems
- Input and Output
- Interrupt
- Scheduling
- Mass Storage
- File Systems
- Synchronization

**Grading Criteria (Subject to Changes):**

We will have one mid-term, one final, and four programming assignments. Each written exam counts 28 points, and the programming assignments count 44 points.

**Programming Assignments/Machine Problems (MPs):**

Unless otherwise specified, all the assignments are individual assignments. Each student must submit his/her own assignments. Please read the policy section before starting to work on your programming assignments. The submission must be done via the assignment submission website on NTU COOL, which will be announced later in the class. All the submissions will be checked to detect plagiarism.

**Policy:**

**Late Assignment**: the programming assignments should be handed in via the provided web-based assignment submission system. All assignments must be handed in before 11:59PM at their corresponding due days. Because of the large class size, it is very likely that the assignment submission web site will be extremely busy at the last minutes. You should not wait until the last minute to submit your assignments. It is your responsibility to make sure that your assignments are handed in before the deadline. So, do it as early as possible. The TA's will not accept the assignments via emails or any other means. Check out the submission web site to see how to make sure your assignments are submitted successfully.

Only the assignments submitted before the deadline will receive full credit. 5% of your grade will be deducted for single day delay.

**Plagiarism**: There is NO tolerance for plagiarism. (As an engineer, you should check out IEEE's code of ethics.) You can discuss the assignments with your classmates and/

| Week # | Date | Topic | Reference textbook: OSC 10e | References Textbook: xv6 | MP Assignment |
|---|---|---|---|---|---|
| 1 | 24/02/20 | Introduction of course | | | MP0: Setup xv6 |
| 2 | 24/02/27 | Introduction to Operating Systems | Ch1 and Ch2 | Ch0 | MP0 Due |
| 3 | 24/03/05 | Process | Ch3 | Ch1 | MP1 Ann |
| 4 | 24/03/12 | Thread | Ch4 | Ch2 | |
| 5 | 24/03/19 | Memory system | Ch9 | Ch3 | MP1 Due/MP2 Ann |
| 6 | 24/03/26 | Memory system | Ch10 | Ch3 | |
| 7 | 24/04/02 | Memory system | Ch10 | Ch3 | MP2 Due |
| 8 | 24/04/09 | MidTerm | | Ch3 | |
| 9 | 24/04/16 | Scheduling | Ch5 | Ch7 | |
| 10 | 24/04/23 | Scheduling | Ch5 | Ch7 | MP3 Ann |
| 11 | 24/04/30 | Mass Storage and I/O systems | Ch11 and 12 | | |
| 12 | 24/05/07 | File Systems | Ch13 | Ch8 | MP3 Due/ |
| 13 | 24/05/14 | File Systems | Ch14 and 15 | Ch8 | MP4 Ann |
| 14 | 24/05/21 | Synchronization | Ch6 and Ch7 | Ch6 | |
| 15 | 24/05/28 | Synchronization | Ch6 and Ch7 | Ch6 | MP4 Due |
| 16 | 24/06/04 | Final Exam | | | |

or friends. However, you MUST write the codes by yourself. It is YOUR responsibility to protect your own codes. Do not leave your codes on the table or screen.

**Schedule:**

The class schedule shown below is tentative and subject to changes. The schedule is also available on the class website, and any change will be announced in the class and on the class website in advance.