CSCI 447 – Operating Systems

Spring 2025

Time: MTWF 2pm

Place: KB 307

Instructor: Phil Nelson

Office/Phone: CF467

Web: `https://facultyweb.cs.wwu.edu/~phil`

E-mail: phil@wwu.edu

Office Hours: 3:00-4:00 PM MTWF, others by appointment. If you send me e-mail, please use plain text (no HTML) messages and include "CSCI 477" in the subject of your e-mail.

Web Access: I have information for this class on the web and Canvas. Assignments and tests will be available on Canvas at the appropriate time. Other information will be provided via the web and Canvas. If you see something missing from the web site or Canvas, please let me know about it via e-mail. My web site is `https://facultyweb.cs.wwu.edu/~phil/classes/s25/447`.

Text: Siberschatz, Galvin, Gagne "Operating System Concepts", John Wiley & sons, 10th Edition, 2019.

Description: This class will give the student an understanding of internal workings of operating systems.

Outcomes: On competition of this course, students will demonstrate:

- Thorough understanding of virtual memory.
- Thorough understanding of process scheduling and the system implementation of multi-threaded kernel and applications.
- Thorough understanding of memory management techniques in operating systems, including the concepts of implementation of virtual memory.
- Thorough understanding of the implementation of file systems and device control.
- Basic understanding of distributed file systems and operating systems.

Graded Work: 3 Tests and Assignments.

Tests: The first test will be given in class on Friday, April 25. The second test will be given in class on Friday, May 16. The final will be given at the regular final time of 1:00 PM on Thursday June 12. Each test will be worth 15% of your final grade. To pass this class you must get at least 50% of the test points.

Assignments: The assignments will be both written and programming. All points will go into a grand total for the assignments. These assignments will be worth 55% of your final grade. Assignments are currently scheduled to be due on April 8, April 16, April 23, May 2, May 12, May 20, May 28 and June 6.

June 6 is the last day of dead week.

Late Work: Work is due *at the beginning of class on the day due.* To be considered "on time", you must submit the required document on Canvas before the time due. Late work is accepted. Work turned in at most TWO meetings of the class will be worth 75% of the original value. Anything turned in after that will be worth 60% of the original value. A late final assignment is worth 75% of the original up until the start of the final test. Canvas is set up to not accept late work after the two meetings of the class. So, an assignment due on Wednesday is accepted at the 75% rate until the beginning of class on the following Monday.

Grading: Grading is done by a percentage of the top score. I reserve the right to pick a fictious top score at or above the 90% of total possible if nobody earns at or above 90% of total possible. The following is my normal grade scale:

A: 100% – 90% of top score

B: 89% – 80% of top score

C: 79% – 65% of top score

D: 64% – 50% of top score

Note: Grades on tests and are assignments are not modified in the grade book to match this scale. This scale is used only at the end of the class for assigning letter grades.

Collaboration: Each student *MUST* do their own programming. Original work is required. Assume you should not see the source code of any other student, past or present. You may discuss problems using diagrams on scratch paper or white boards, work together to understand the problems, but you should not design solutions together. You should not see any other student's source code or pseudo code for solutions. Whiteboard coding together is cheating for this class. Even helping a fellow student debug their program so that source code is seen should be avoided. Students

having problems should e-mail me or visit my office. I am your BEST source of help to get your work finished.

Cheating: Is (obviously) not allowed. If you do cheat and are caught you will receive an F as your grade for the class. This includes *ALL* students knowingly involved in any cheating event. Not properly protecting your source code may be considered knowingly involved. White board coding of solutions is considered cheating. I use mechanical means to compare student programs. These comparisons are used to raise the possibility of cheating, but all decisions about cheating will be made by me after inspecting the programs of all students involved. *DO NOT* recycle your program printouts in the school's recycle bins or where other students in this class have access to them.

Final Assignment: Your final assignment will be due on June 6, 2025, the last class of dead week. A late final assignment will be worth 75% of its original value until the start of the final test.

Western Syllabus Policies: For generic syllabus policies of Western, visit: `https://syllabi.wwu.edu`.

Outline of Course: Expected order:

- Introduction to OSes
- Basic OS structures
  - Services
  - System calls
  - Operating System Structure
  - Virtual Machines
  - System Boot
- Processes
  - Process abstraction
  - Process scheduling
  - Interprocess Communication
  - Threads in the OS
  - Implementation of threads
  - Synchronization
  - Deadlocks
- Memory Management

  - Main Memory
  - Swapping
  - Paging
  - Virtual Memory
  - VM implementation and issues
- Storage Management
  - File systems
  - Kernel File System Structures
  - FS implementation
  - Mass storage
  - I/O systems
- Protection and Security
  - Protection Goal
  - Protection Methods
  - Security issues
  - Security techniques
- Introduction to Distributed Systems
  - Basics of Distributed Systems
  - Subsystems of DS
  - Basics of Distributed File Systems
- Other OS topics as time allows