

SYLLABUS

Fall, 2022

CSC 381 Operating System Principles

3.0 credits

Prerequisite(s): CSC 260

Instructor: Beifang Yi
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Office: MH 208B
Hours: TWRF (12:25-1:40)

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Section	Time	Room	Final Exam
01	W & F 1:40-2:55pm	MH 344	December 15, Thursday, 2:00pm-4:00pm MH 344
Office Hours		12:25—1:40 (Tuesday, Wednesday, Thursday, Friday), MH208B	

Catalog description:

This course presents the evolution of computer operating systems, operating system functionalities, and current design and implementation techniques. Relationships between the operating system, computer architecture, and the user community are discussed. Three lecture hours per week. Not open to students who have received credit for CSC280.

Course Goals:

The aims of this course are:

- CG01: present a descriptive overview of modern operating systems, their purposes and their design principles;
- CG02: discuss the most important ingredients, techniques, and algorithms used in their operating system construction;
- CG03: foster an understanding of fundamental technical issues in the implementation of modern operating systems.

Course Objectives:

Upon completion of this course, the student will have demonstrated the ability to:

- CO01: summarize the development of operating systems from single-user and batch processing mainframes to modern multitasking systems
- CO02: describe the mechanisms of interrupts and Direct Memory Access;
- CO03: describe how a process or task is represented in a modern computer system;
- CO04: differentiate between the concepts of process and thread and describe the behavior of a multithreaded system;
- CO05: describe the system components, actions, and algorithms involved in scheduling and managing concurrent processes;
- CO06: describe the concept of deadlock and the common techniques for recognizing, predicting, avoiding, and recovering from it;
- CO07: describe the common techniques and problems involved in memory management, including paging and virtual memory;
- CO08: describe the common techniques and problems involved in management of disk storage;
- CO09: describe the common techniques and problems involved in file management;
- CO10: describe the common techniques and problems involved in system protection and security.

Course Topics:

A detailed topics list and a general course bibliography can be found from the Computer Science Department; contact the department office or Computer Science Curriculum Director more information.

The focus of the course is on a general discussion of the nature and functionality of operating systems. There is no extended treatment of specific case studies, although examples drawn from specific systems are used to illustrate major concepts. In addition to

the topics listed in the above link, we may also briefly introduce the following special purpose systems:

- threads and thread programming
- virtualization/virtual machines
- Linux

Text(s): (required) **Operating System Concepts, 10th Edition**, by A. Silberschatz, G. Gagne, et al. Wiley, 2018.
(Note: get the text's *10th edition, electronic version E-book* is preferred.)

Required Material:

(Required) Thumb (flash) drive (or other portable memory devices and/or online storage), 64 GB minimum.

Additional references (optional):

- Course website: http://weblab.salemstate.edu/~byi/CSC381_Silberschatz/index.html .
- *Linux with Operating System Concepts*, by Richard Fox, Chapman & Hall/CRC, 2017.
- *Operating Systems: Three Easy Pieces*, 1st Edition, by CreateSpace Independent Publishing Platform, 2018.
 - <http://pages.cs.wisc.edu/~remzi/OSTEP/>
- *Mastering Lambdas: Java Programming in a Multicore World* (Oracle Press), 1st Edition, by Maurice Naftalin. McGraw-Hill Osborne Media, 2014.
 - <https://docs.oracle.com/javase/tutorial/java/javaOO/lambdaexpressions.html>
 - <http://www.oracle.com/webfolder/technetwork/tutorials/obe/java/Lambda-QuickStart/index.html>
- *Start Concurrent: An Introduction to Problem Solving in Java with a Focus on Concurrency*, by Barry Wittman. And Tim Korb. Purdue University Press (Kindle/2014, paperback/2013). Or through the following link:
 - <https://start-concurrent.github.io/>
- *Parallel and Concurrent Programming in Haskell: Techniques for Multicore and Multithreaded Programming*, 1st edition, by Simon Marlow. O'Reilly Media, 2013.
- *Java: How to Program*, 11th edition. Deitel & Deitel. Prentice Hall, 2018.
- *Effective Java*, 3rd Edition, Addison-Wesley Professional, 2018.
- VMWare website: <https://www.vmware.com/>.
- (Other course study guides and materials will be posted on the course website and/or LMS/Canvas.)

Cell phones:

Turn the ringer off, or, better yet, *turn the phone off*.

Class Attendance:

Class attendance is highly recommended. You are responsible for all materials presented in class, examinations, and other announcements. No excuses of any nature will be construed as relieving you from the responsibility for completion of the work assigned. Each student is responsible for completing all course requirements and for keeping up with all that goes on in the course (whether or not the student is present).

We will use SSU's online course management system, Canvas (<https://elearning.salemstate.edu/>) to post all types of assignments (including different formats/types of tests), grades, and announcements regarding the course topics and progress. You will need to visit Canvas (with your SSU Navigator use-name and password) for the course activities. Canvas uses your *SSU-stored email* box for the communication between you and the instructor and thus you **must use this email** address. Each student is responsible for completing all course requirements and for keeping up with all that goes on in the course (whether or not the student is present).

Final Grade:

Final grade will be determined using the following grading weights:

written assignments	18%
projects	32%
mini-tests	22%
midterm examination	10%
final examination	18%

Attendance is not used to calculate the final overall grade: *however*, note that you are at all times responsible for all the assignments and materials presented in class.

The following table shows how the course work is assessed against the course objectives:

	Written Assignments	Projects	Examinations
CO01	✓		✓
CO02	✓		✓
CO03	✓	✓	✓
CO04	✓	✓	✓
CO05	✓	✓	✓
CO06	✓	✓	✓
CO07	✓	✓	✓
CO08	✓	✓	✓
CO09	✓		✓
CO10	✓		✓

Projects:

There will be several projects (including programming projects) to be completed throughout the semester. The programming languages and platforms will vary (C/C++, Java... Windows, Linux...) and will be given out in class. These projects will help students understand the basic concepts of modern operating systems and get hands-on experience in the implementation of some concepts and functions of the operating systems. There is a deadline to each project and **penalty** will be imposed for late submissions (see the Due Dates/Time below).

For each project, a write-up should be submitted which describes the problem, solutions, and other requirements (usually, there are additional requirements for the assignments). For a programming project, it should provide the following: (a) instructions on how to compile and run the program, (b) testing results, (b) source code, and (d) input data (if applicable).

Please note that each project has specific requirements and it is important that you read these requirements before working on the project. For some projects, presentation and demo in the class constitute a significant portion of the project requirements.

All the projects must be submitted at Canvas (<https://elearning.salemstate.edu/>).

Homework/Written Assignments:

There will be a series of written assignments from the textbook and other sources: question-answering, short essay-writing, and/or reporting of calculation results. Reading will be a part of the written assignments. Please note that in addition to these (written) assignments there will be (Programming) Projects. There is a deadline to each assignment and **penalty** will be imposed for late submissions (see the Due Dates/Time below).

All the assignments must be submitted at Canvas (<https://elearning.salemstate.edu/>).

Each assignment may have different full score points, depending on the difficulty and the amount of the work of the exercises. All the assignment questions might be in the examinations.

Mini-tests are the extended course assignments that are closely related with the written assignments. They serve as an important study aid and testing procedures and evaluations of the learning of coursework: first working on the assignments and then taking these mini-tests for the enhancement of the understanding of the course subjects.

Examinations/Tests/Mini-tests:

There will be one midterm and one final (comprehensive) examination. The midterm will be held in the “middle” of the semester

depending on class progress. The final examination will be a comprehensive examination, i.e., covering all the topics given in the class with emphasis on assignments (reading/writing), selected mini-test questions, and project-related topics.

Mini-tests serve as important testing procedures and evaluations of the learning of coursework: first working on the assignments and then taking these mini-tests for the enhancement of the understanding of the course subjects.

Note: Make-ups are given for examinations/mini-tests only under exceptional circumstances and with documented circumstances (electronic documents are OK under special circumstances).

Missed Tests/Mini-tests/Examinations:

Missed tests will be made up *only under extreme conditions/emergency with the proper documentation*. Students who know in advance that they must be absent on an exam day for an excusable reason should notify the instructor prior to the exam day. Students who are absent on the day of the exam for an excusable reason should contact the instructor immediately following their absence. Makeup work will be permitted *only when* the instructor is presented with acceptable documentation for acceptable absences. It is student's responsibility to notify the instructor of any excused absence as far in advance as possible.

Due Dates/Time:

- Late submission of assessed assignments or projects will result in penalties defined in the following:
 - **25 percentage** points will be deducted for being late, up to 24 hours.
 - **50 percentage** points will be deducted for being late, more than 24 hours and up to 48 hours.
 - **75 percentage** points will be deducted for being late, more than 48 and up to 72 hours.
 - **100 percentage** points will be deducted for being late more than 72 hours (i.e., a grade of **zero** will be given).
 - A grade of **zero** will be given for any assignments including projects which are submitted after the final examination time. That is: **no assignments (including semester project) will be accepted after the final examination**.
- Should there be an emergency that prevents you from completing/submitting your assignments/projects on time, you will need to send *an email request* for the extension on the coursework submission. The instructor will reply to this request email with a specific number of days for the extension period or a new deadline for the assignment and you will need to keep *this email as a record of the extension approval*. Sending only a request email does **not** guarantee the extension approval.
- **Please double-check** your submissions (since your assignment submissions are usually graded after their deadlines): to guarantee your successful and correct submissions, you would need to download your submissions and examine the downloaded materials; as for the projects, you would need to check the downloaded programs and then compile/run the code.

Study Groups:

While I strongly encourage study groups, I require that each student hand in his/her answers in her/his own words - if two answers are highly similar to each other, neither will receive credit.

When working on your programming projects, you may discuss with others the project topics, the algorithms and methodologies related to the project; but when you work on writing the code, this coding work should be 100% of your own work. **If two answers/written code segments come out exactly the same or highly similar, neither will receive credit and/or further actions will be taken** (such as reporting to the department and/or university).

Academic Integrity:

Academic Integrity Policy and Regulations can be found in the University Catalog and on the University's website (http://catalog.salemstate.edu/content.php?catoid=13&navoid=1295#Academic_Integrity). The formal regulations are extensive and detailed - familiarize yourself with them if you have not previously done so. A concise summary of and direct quote from the regulations: "Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts". *Submission of other's work as one's own without proper attribution is in direct violation of the University's Policy* and will be dealt with according to the University's formal Procedures.

All students are expected to be familiar with the academic regulations, including those regarding Academic Integrity, for Salem State University as published in the college catalog. In addition, each student is responsible for completing all course requirements and for keeping up with all that goes on in the course (whether or not the student is present).

Salem State University is committed to providing equal access to the educational experience for all students in compliance with Section 504 of The Rehabilitation Act and The Americans with Disabilities Act and to providing all reasonable academic accommodations, aids and adjustments. Any student who has a documented disability requiring an accommodation, aid or adjustment should speak with the instructor immediately. Students with Disabilities who have not previously done so should provide documentation to and schedule an appointment with Disability Services and obtain appropriate services.

Students must comply with any Covid-19 Health and Safety Protocols for the 2022-2023 Academic Year. Students should review the information found at <https://www.salemstate.edu/covid19>.

In the event of a university declared critical emergency, Salem State University reserves the right to alter this course plan. Students should refer to [Salem State](#) for further information and updates. The course attendance policy stays in effect until there is a university declared critical emergency. In the event of an emergency, please refer to the alternative educational plans for this course located at Canvas (<https://elearning.salemstate.edu/>) where the course contents such as announcements, assignments are posted. Students should review the plans and gather all required materials before an emergency is declared.

Please remember that if, for any reason, you decide to drop this course, you **MUST** do so officially through the Registrar's office. The last day to withdraw from a course this semester is **November 28th**.

Note: This syllabus represents the intended structure of the course for the semester. If changes are necessary, students will be notified in writing and via all regular class communication mechanisms (class discussion, emails, and/or the course link at Canvas <https://elearning.salemstate.edu/>).

Course Schedule for CSC381
(Subject to Change)

Week	Dates	Contents (textbook chapters and others)
1	9/7—9/9	Warming-up: Windows, Unix, Linux Virtual Machines
2	9/12—9/16	Virtual Machines—Ch. 18 Computer System/Organization
3	9/19—9/23	Ch. 1 Introduction
4	9/26—9/30	Ch. 2 OS Structures
5	10/3—10/7	Ch. 3 Processes Ch. 4 Thread & Concurrency
6	10/10—10/14	Ch. 5 CPU Scheduling
7	10/17—10/21	Ch. 6 Synchronization Tools Java Thread Programming
8	10/24—10/28	Ch. 7 Synchronization Examples Ch. 8 Deadlocks
9	10/31—11/4	Ch. 9 Main Memory Ch. 10 Virtual Memory
10	11/7—11/11	Ch. 11 Mass-Storage Structure Ch. 12 I/O Systems
11	11/14—11/18	Ch. 13 File-System Interface Ch. 14 File-System Implementation Ch. 15 File-System Internals
12	11/21—11/25	Ch. 16 Security (Thanksgiving Recess)
13	11/28—12/2	Ch. 16 Security Ch. 17 Protection
14	12/5—12/9	Ch. 19 Networks & Distributed Systems Other Topics: Case Studies Reviews
15	12/12—12/16	Final Examination Dec 15 th , Thursday, 2:00pm—4:00pm, MH344