CS 630 - 002 Operating Systems Design

Spring 2020

Class schedule:
Wednesdays, 11:30 AM - 02:20 PM, in CKB 222

Instructor:
Jing Li, jingli@njit.edu, GITC 4106

Class Overview:
An intensive study of computer operating system design including multiprogramming, time-sharing, resource scheduling, synchronization of concurrent processes, management of hierarchical storage, embedded and real-time systems, virtualization and distributed systems.

Tentative schedule:

1. Overview;
2. OS concepts;
3. Scheduling (uniprocessor);
4. Scheduling (real-time);
5. Processes;
6. Threads and parallel computing;
7. Concurrency;
8. Midterm Exam;
9. Synchronization;
10. Deadlock;
11. Memory management;
12. Disk management;
13. File systems;
14. Page Replacement; Final exam review;
    Distributed Systems and Virtualization (If time permits);

***Disclaimer**: The schedule of the course is subject to change based on the progress of the class, including test dates after they are announced. These changes will be announced as early as possible.*

Course format:
The course will study principles, challenges and some state-of-the-art solutions in operating systems. It also involves hands-on lab assignments, reading and presenting research papers.

You are encouraged to collaborate on assignments. However, you must cite all your collaborators (teammates) and any sources beyond the class materials that you consulted while working on a problem—for example, an "expert" consultant other than the teacher, or another text—must be given a proper scholarly citation, which you should include with your submission.

Lab assignments:
Students can work on the lab assignments in teams of up to 3 members. Student teams may change from assignment to assignment, but the sharing of code between teams is strictly prohibited. Labs submitted on time (as determined by Canvas's receipt time stamp) do not have penalty. Labs submitted up to 72 hours late will be given a 20% penalty. Labs submitted less than a week late will be given a 50% penalty. Labs submitted after a week late will not be given credit.

Class participation – Option 1 Answer questions in class:
Students are encouraged to answer questions in class.

Class participation – Option 2 Paper presentation:
Students are encouraged to work in a team of 2 members to prepare presentations (based on research papers) and lead the discussion on the paper. Each team is responsible for presenting one paper with a 20 to 30min presentation. The presentation should:

(1) provide enough background introduction for understanding the paper
(2) identify paper's motivations, goals and assumptions
(3) present contributions of the work with sufficient details, including but not limited to the design, implementation, mechanisms, evaluation and analysis of the system
(4) give comments on the paper (i.e. strengths, limitations, possible extensions)

Midterm and final exams:
According to the NJIT policy, all final exams will be scheduled in the week 15 by the registrar (see the registrar's page: http://www.njit.edu/registrar). For the midterm and final exams, there will be no make up exams. You must plan your semester accordingly. If you should miss the exam(s) due to emergency, please go to the Dean of students and explain your situation as to why you had to miss. Dean's memo will be necessary but not sufficient to consider for handling your missed exam(s). This is the NJIT policy for missed exams. No other policy will be applied.

Course materials:
Textbook:
Operating Systems: Internals and Design Principles by William Stallings

Recommend books:
Operating System Concepts by Silberschatz, Galvin, and Gagne.
Operating Systems: Three Easy Pieces by Arpaci-Dusseau and Arpaci-Dusseau is a good introduction to operating systems, without all the complexities of Linux.
Understanding the Linux Kernel by Bovet and Cesati, 2006, offers a more exhaustive reference than the course textbook, covering many data structures and code snippets in detail.

Readings:
Each topic will be accompanied by classical and recent research papers from top conferences and journals.

Other useful references:
LWN.net is a news and information outlet for the open source community. They often run very high quality articles about kernel development, kernel architecture, and kernel mechanisms. When I have trouble finding a good online resource, a search for "lwn.net (my_topic)" often yields good results. However, beware of out-of-date material.
Linux Journal is a magazine covering the Linux community. They often run very high quality articles about kernel development, kernel architecture, and kernel mechanisms. Similar to above, searching for "Linux Journal (my_topic)" often yields good results. As above, beware of out-of-date material.
Linux Cross Reference by free-electrons.com. This tool easily allows you to browse the Linux source code as well as search for identifiers. Beware that the source code on this site is not identical to the code base we are using in class, but it is still useful.

Prerequisites:
Students should have taken introductory courses of operating systems prior to this course (equivalent of CS252/CS332). Proficiency in C (and/or C++) is a firm prerequisite. Basic Proficiency in using Linux is very beneficial (equivalent of CS288/CS433 are encouraged). If in doubt about the prerequisites, please consult with the instructor for permission to take the class.

Grading:
Class Participation – 5 points
Lab Assignments – 30 points
Midterm Exam – 30 points
Final Exam – 35 points
Final grades will be curved according to departmental policy.

Office Hours and Contact Information:
Fridays, 2:00 pm - 6:00 pm
Please make appointments by email for other times.
Jing Li: jingli@njit.edu, GITC 4106

Teaching Assistant:
Shaoze Fan, sf392@njit.edu
Office hour: GITC 4325, Wednesday 10:00AM to 11:30AM.

Honor Code:
The NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students. You are required to read the NJIT Policy on Academic Integrity: https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Modifications to syllabus:
The syllabus may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the syllabus.