Syllabus

CS59200: Reliable and Secure Systems

Fall 2022

Updated: April 15, 2022

1 Overview

If systems are not reliable and secure the entire software stack falls apart. How can we test effectively large and complex software systems? How can we build reliable systems that are concurrent and distributed? How can we diagnose failures and performance problems in complex systems? What are the limitations and challenges of leveraging trusted hardware? What is the relation between testing and formal verification techniques?

This advanced graduate course addresses the above questions. It will be heavily based on class discussion and will involve reviewing the current state-of-the-art. This course will focus mostly on practical aspects of building and testing systems. We will discuss several topics in this context, including data race detectors, symbolic execution tools, techniques that expose concurrency and distributed bugs, trusted hardware approaches, application of formal techniques to systems, and the results of empirical studies on systems reliability. Knowledge of operating systems, distributed systems or C programming is a plus.

2 Teaching staff

- Pedro Fonseca (Instructor)

3 Learning objectives

This course has the following learning objectives:

- Understand the fundamental reliability and security challenges and tradeoffs that the system designers have to address.
- Learn how to write and employ state-of-the-art testing tools.
- Understand how system interfaces affect the tradeoffs between performance and reliability.

4 Grading structure overview

- Research Project: 30%
- Paper Presentations: 20%
- Paper Reviews: 30%

- Midterm: 20%

Research Project: Students are expected to work on a research project within the scope of the course. The project can be done individually or in groups of students depending on the topic. Students will present the project proposal, status, and results to class during the course.

Paper presentation: Each student is expected to present and lead the discussion of papers from the research literature to class (see the list of suggested papers). Students are expected to present the paper as if it was a conference talk: provide background, motivation, explain overall merit and technical details, and answer questions from the audience. Students should feel free to critique the paper (i.e., students do not need to be advocates of the paper). All students are expected to read the presented paper before class and participate in the class discussion.

Paper reviews: Each student will review six papers and write a written report for each of them, as if reviewing a conference paper.

For academic honesty refer to the Purdue integrity/code of conduct. Except as by prior arrangement or notification by the professor of an extension before the deadline, missing or late work will be counted as a zero/fail.

5 Course Format

5.1 Lectures

Lectures will be in person (i.e., during the posted lecture time). Every student is expected to attend most of the lectures.

5.2 Office hours

Office hours attendance are optional. Office hours will be announced during lecture and/or Piazza.

6 Academic honesty

6.1 Independent work

All work turned in must be that of the **individual** student unless stated that otherwise is allowed.

- Do not share or copy from others.
- Do not use or look at code found online.
- Violations will result in zero credit or more severe sanctions to all students concerned.

The project can be done in groups, but the collaboration needs to be fully disclosed when delivering work (e.g., talks and reports) and the emphasis should be on the work that the student did.

The course will have a zero tolerance policy towards cheating of any kind and any student who cheats will get:

- Zero grade for the project/quiz/exam at first offense
- F grade for the course thereafter

Both the cheater and the person(s) who aided the cheater will be held responsible for cheating. If in doubt about this policy **ask the instructor beforehand** and only proceed with a written answer.

6.2 Other resources

For additional resources on academic honesty refer to the Purdue integrity/code of conduct. Except as by prior arrangement or notification by the professor or an extension before the deadline, missing or late work will be counted as a zero/fail.

7 Student responsibilities

- Attend lectures and actively participate during lectures.
- Read recommended material and lecture notes.
- Submit projects and assigmenets on time.

8 Staff contact

To contact the course staff please use the following methods in order of preference:

1. **Office hours**
2. **Email** (email must include the "[CS590] " prefix in subject)

9 University policies

9.1 Accessibility

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let your instructor know so that you can discuss options.

You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247. (The weblink to the DRC is also available below.)

For accessibility concerns beyond this, the Office of Institutional Equity is responsible for ensuring Americans with Disability Act compliance, can be contacted with any accessibility concerns at:

Phone: (765) 494-7253
Email: equity@purdue.edu
TTY: (765) 496-1343
Website: http://www.purdue.edu/ethics/oie/

9.2 Emergency preparedness

To report an emergency, call 911. To obtain updates regarding an ongoing emergency, sign up for Purdue Alert text messages, view:
http://www.purdue.edu/ea.

There are nearly 300 Emergency Telephones outdoors across campus and in parking garages that connect directly to the PUPD. If you feel threatened or need help, push the button and you will be connected immediately.

If we hear a fire alarm during class we will immediately suspend class, evacuate the building, and proceed outdoors. Do not use the elevator.

If we are notified during class of a Shelter in Place requirement for a tornado warning, we will suspend class and shelter in the basement.

If we are notified during class of a Shelter in Place requirement for a hazardous materials release, or a civil disturbance, including a shooting or other use of weapons, we will suspend class and shelter in the classroom, shutting the door and turning off the lights.

Please review the Emergency Preparedness web site for additional information.
http://www.purdue.edu/ehps/emergency_preparedness/index.html

10 Course updates

Information provided by the instructor supersedes the information in this document.