

# Syllabus

## CS550: Advanced Operating Systems

<http://www.cs.iit.edu/~iraicu/teaching/CS550-F15/>

**Semester:** Fall 2015

**Lecture Time:** Monday/Wednesday, 11:25AM - 12:40PM

**Location:** Perlstein Hall (PH) 131

**Professor:**

- **Dr. Ioan Raicu** ([iraicu@cs.iit.edu](mailto:iraicu@cs.iit.edu), 1-312-567-5704)
  - Office Hours Time: Monday 12:45PM-1:45PM (SB237D), Wednesday 10:20AM-11:20AM (SB237D)

**Teaching Assistant** ([cs550-f15@datasys.cs.iit.edu](mailto:cs550-f15@datasys.cs.iit.edu)):

- **Tonglin Li** ([tli13@hawk.iit.edu](mailto:tli13@hawk.iit.edu))
  - Office Hours Time: Tuesday/Thursday 5:00PM-6:00PM (SB002)



### Course Description

This course covers general issues of design and implementation of distributed systems. The focus is on issues that are critical to the applications of distributed systems and computer networks, which include interprocess communication, distributed processing, sharing and replication of data and files. Approximately two third of the course will be devoted to basic concepts and techniques, and the remaining third will be on assorted current topics in modern distributed systems.

### Text Books

- **REQUIRED:** Andrew S. Tanenbaum and Maarten van Steen. “Distributed Systems: Principles and Paradigms”, Prentice Hall, 2nd Edition, 2007
  - <http://www.amazon.com/Distributed-Systems-Principles-Paradigms-Edition/dp/0132392275>
- **OPTIONAL** (but will be required in CS553): K. Hwang, G. Fox, and J. Dongarra. “Distributed and Cloud Computing”, Morgan Kaufmann, 2011
  - <http://www.amazon.com/Distributed-Cloud-Computing-Parallel-Processing/dp/0123858801>

### Prerequisites

CS450 Operating Systems; CS550 is a good foundational course for many other courses, such as [CS546](#), [CS552](#), [CS553](#), [CS554](#), and [CS570](#). Many of these graduate courses are part of the [Master of Computer Science Specialization in Distributed and Cloud Computing](#).

### Detailed Course Topics

- Introduction to Distributed Systems
- System Architectures & Client-Server Models
- Remote Procedure Call
- Remote Method Invocation
- Message- and Stream-Oriented communication
- Processes and threads
- Accelerator Architectures
- Accelerator Programming
- Code migration and scheduling
- Naming
- Synchronization
- Consistency models
- Fault Tolerance
- Networked file systems
- Parallel File Systems
- Distributed File Systems

### Programming Assignments

There will be 3 programming assignments throughout the semester, each worth 10% of the total grade, and each taking about 2.5 weeks to complete. These assignments will be completed individually. The projects will require knowledge of Java, C and/or C++. It is expected that students know the basics of these languages. Assignments will be submitted through BlackBoard.

### Computer Usage

Computer systems that can be used for development of projects (more information about access to these will be passed in the first several lectures):

- **Jarvis:** 20-node (100+ cores) Linux Cluster running SGE and NVIDIA GPUs
- **Amazon AWS:** \$100 credit per student

## Project

There will be a major project spanning 4 weeks involving the performance benchmarking of a real distributed system, a written report, and a poster presentation. Students are to complete this project independently. The evaluation will be done on the Amazon AWS cloud. Everyone will conduct the same evaluation. These assignments must be submitted through BlackBoard. For in-class students, there will be a mandatory poster presentation on November 30<sup>th</sup> and December 2<sup>nd</sup> during class time.

## Late Policy

Assignments will be due at 11:59PM on the day of the due date, through BlackBoard. There will be a 15-minute grace period. There will also be a 7-day late pass, where students can submit late assignments without penalty; the late pass can be used in 1-day increments spread out over multiple assignments. Any late submissions beyond the grace period and beyond the 7-day late pass, will be penalized 10% every day it is late. Assignments will not be accepted after the solutions have been posted. Quizzes cannot be taken late, and cannot use late passes.

## Exams & Quizzes

There will be bi-weekly short 10 min quizzes covering material from the prior 2 weeks; each quiz will be worth 5% of the grade. All students will take the quizzes online, you do not have to go to a testing center to take the quiz. The quizzes will be on the following schedule:

- **Wednesday, September 16<sup>th</sup>, 2015**
- **Wednesday, September 30<sup>th</sup>, 2015**
- **Wednesday, October 14<sup>th</sup>, 2015**
- **Wednesday, October 28<sup>th</sup>, 2015**
- **Wednesday, November 11<sup>th</sup>, 2015**

There will be 1 final exam that will cover material from the entire semester. The exams will be individual, but students will be allowed to use their textbooks and any notes they have (on paper). No electronic devices such as phones, eReaders, tablets, or laptops will be allowed. Simple calculators can be used. The final exam will be worth 25% of the overall grade. In-class students must take the exam in class. Online students can take the exam at an official testing center. The final exam will be scheduled on: **Monday, November 23<sup>rd</sup>, 2015 from 11:25AM - 1:25PM in Perlstein Building 131**. Please note that the exam is extended for 45 minutes after the usual end of class, but this should not interfere with anyone's other classes due to the lunch period. Also note that the exam is scheduled during normal class period, and not the official final exam week. **There will be no makeup exams or quizzes. Of the 5 quizzes, I'll drop your lowest quiz score when computing your final grade.**

## Grades

Grading Policies:

- **Project (1):** 25% -- can use late day passes
- **Programming Assignments (3):** 30% -- can use late day passes
- **Quiz (5):** 20% -- will drop lowest grade; no makeups
- **Exam (1):** 25%; -- no makeups

The following grading scale will be used. The scale will be adjusted downwards based on the overall performance of the entire class. Typically, the class average score in my classes is about 80 points out of 100, and will typically fall in a solid B-grade range.

- **A: 87% ~ 100% (for PhD students, you must be in the top 25% percentile, see below for more details)**
- **B: 75% ~ 86%**
- **C: 62% ~ 74%**
- **D: 50% ~ 61%**
- **E: 0% ~ 49%**

If you are a **PhD student signed up for the PhD section**, you must score in the top 25% percentile from the entire class to obtain an A (which will give you a PASS for the System Qualifier). If you are not in the top 25% of the students, then the above grading scale will apply.

## Mailing lists

This course will use Piazza to facilitate discussions for assignments, at <http://piazza.com/iit/fall2015/cs550/home> (it has not been setup yet, more instructions will follow). Piazza should be the primary mechanism of communication between the students and the professor and the TAs. If you have a question and want to reach only the TAs and professor, send email to [cs550-f15@datasys.cs.iit.edu](mailto:cs550-f15@datasys.cs.iit.edu). As a last resort, send individual emails directly ([iraicu@cs.iit.edu](mailto:iraicu@cs.iit.edu), [tli13@iit.edu](mailto:tli13@iit.edu)) when you believe the message is not appropriate to be sent to the entire class, or to all the TAs and professor. I expect to have an additional TA assigned to this class in the coming days.