Thesis Course Syllabus

Course Information

Course Prefix and Number: CS 7210
Course Name: Distributed Computing
Instructor: Ada Gavrilovska

Course Description

This course will cover both fundamental concepts in distributed computing and discuss system designs enabling distributed applications. The objectives of the course include: In-depth understanding of core concepts of distributed computing, including study of both abstract concepts and practical techniques for building system support for distributed applications; construction of distributed system components by doing project work; and understanding of the current state of the art in several areas of distributed systems.

Course Learning Outcomes

There are several learning outcomes of this course, centered around the following main topics:

1. *Distributed systems concepts, protocols and mechanisms*: Upon successful completion of this course, students will be able to understand the core concepts in distributed computing, such as logical clocks, consistent cuts, consensus, replication and fault tolerance, etc., as well as the common techniques to implement them, so as to build correct and performant distributed systems and applications.
2. *State-of-the-art developments in distributed systems*: Upon successful completion of this course, students will be familiar with multiple practical distributed systems which underpin popular real-world distributed applications and services and will be able to understand how such systems are realized by relying on core distributed computing concepts.
3. *Interplay of emerging technologies and paradigms and distributed systems*: Upon successful completion of this course, students will be able to understand how emerging technology trends concerning new hardware and applications, influence the designs and implementations of distributed systems.
4. *Practical experience with implementing distributed computing techniques*: Upon successful completion of this course, students will be able to solve distributed computing problems and to develop distributed services and applications, by gaining practical experience through a series of programming assignments.

Required Course Materials

No textbook is required for this course. The course material includes required reading of research papers (often partial reading only) associated with each lecture. All research papers, required reading, and recommended reading will be provided as PDFs.

You can find free online textbook resources at these links:

- *Distributed Systems for Fun and Profit*, http://book.mixu.net/distsys/
- *Distributed Systems,* https://www.distributed-systems.net/index.php/books/ds3/

Grading Policy

Assignment Distribution and Grading Scale:

Assignments	**Weight**
Programming assignments	55%
Mid-Term Exam	20%
Final Exam	20%
Class Participation	5%
Total	**100%**

The course will include 5 programming assignments in Java, based on the Distributed Systems Labs (DSLabs): https://github.com/emichael/dslabs:

- **Project 0 DSLabs Intro**: students are guided to get familiar with the project framework and programming routines – *5% of course grade, 1 week estimated*
- **Project 1 Client-Server**: an exactly-once RPC protocol is implemented and tested on top of an asynchronous network – *10% of course grade, 2 weeks estimated*
- **Project 2 Primary-Backup**: a classical primary-backup protocol for fault-tolerance is implemented – *10% of course grade, 3 weeks estimated*
- **Project 3 Paxos**: the *PAXOS* protocol for system consensus is implemented. Students will follow the lecture contents and some published papers – *15% of course grade, 4 weeks estimated*
- **Project 4 Sharded KV Store**: a sharded key/value store out of multiple replica groups, with each of them using PAXOS for requests ordering internally, is built. A two-phase commit protocol is introduced for transactions – *15% of course grade, 4 weeks estimated*

The exams will be based on the material covered in the course lectures and on the assigned required reading. The exams will be open access to papers, proctored via HonorLock, and are not cumulative.

Class participation will consider your participation on the class Piazza site, or on the course informal Slack channel.

Grading Scale
Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Attendance Policy

This is an online course, part of the GT OMSCS program, and the course does not include scheduled class meetings.

Academic and Research Honesty/Integrity Statement

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review the Student Code of Conduct and the Academic Honor Code, especially Appendix A: Graduate Addendum to the Academic Honor Code.

Students are expected to perform research in an ethical and responsible manner. All Doctoral and Master's Thesis students are required to take the Responsible Conduct of Research training, and it is expected that students abide by the principles taught in that training while performing research for this thesis course.

Allegations of scientific or scholarly misconduct are handled in accordance with the procedures outlined by the Policy for Responding to Allegations of Scientific or Other Scholarly Misconduct.

Core IMPACTS

Not applicable.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Expectations of Advisors and Advisees

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Expectations of Advisors and Advisees articulates some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.