

Topics in Cloud Computing Section 02

CS 218

Fall 2024 3 Unit(s) 08/21/2024 to 12/09/2024 Modified 09/14/2024

Course Description and Requisites

Topics in cloud computing, including distributed system models, virtual machines, virtualization, cloud platform architectures (IaaS, PaaS, SaaS), service-oriented architectures, cloud programming and software environments, peer-to-peer computing, ubiquitous cloud, cloud security and trust management.

Prerequisite(s): CS 149 and Graduate standing. Allowed Declared Major: Computer Science, Bioinformatics, Data Science. Or instructor consent.

Letter Graded

* Classroom Protocols

Except for group projects, all assignments are to be done for yourself. In either case, you are not expected to use external resources such as people not in your group or AI tools.

If I am doubtful that you did the work yourself, I might ask you to explain your submission to me in person. If it is obvious that you did not do the work yourself, you will receive a 0 on the assignment at the first offense. Further, offense will result in a report to the Office of Student and Ethical Conduct.

Note that for class presentations, it is okay to use figures or slides from external sources, assuming the author permits it and you cite your sources.

However, you need to understand what you are presenting, and often creating your own presentation material is the best way to build that understanding.

When in doubt if some external source or tool is permitted, please ask the instructor.

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Goals

This course aims to familiarize students with research in distributed systems. After completing the class, they will have acquired the following skills.

1. A basic understanding of core topics in cloud computing
2. Be able to read and understand academic papers
3. The ability to present academic work in writing and in person
4. Intuition on how to conduct research in distributed systems

Course Materials

There is no text book for this class, but each meeting will have an academic paper assigned to it.

The instructor might provide additional materials (blogposts, videos, etc.) for some papers to make them easier to understand.

Course Requirements and Assignments

Final Project

Up to three students will work on an independent project and present their results at the end of the class.

For example, they could measure and compare the performance of existing systems, adding a new feature to an open source project, or perform a literature review for a specific topic.

At the end of the semester, each group will give a short presentation (5-10 minutes) about their project, and submit a written project report.

Class Presentation

Each student will present one research paper to the class. This will give you the opportunity to practice your presentation skills and get a deeper understanding of a particular piece of academic research.

Before students give the presentation, they can meet with the instructor and get feedback on their slides and clarify any open questions about the work they present.

Warmup Projects

There will be one or two small projects in the beginning for students to familiarize themselves with distributed systems and cloud computing.

Participation and Paper Reviews

Part of the grade is based on the student's participation in class and occasional short reviews for papers discussed in class.

✓ Grading Information

10%	Participation and Paper Reviews
20%	Warm-up Project(s)
40%	Final Project
30%	In-Class Presentation

University Policies

Per [University Policy S16-9 \(PDF\)](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on the [Syllabus Information](https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

Each lecture focuses on one or multiple papers that we will discuss in class.

This schedule is tentative. Please check canvas for a more up-to-date version.

Date	Section	Topic
8/19		No Class
8/21	Introduction	What is Cloud Computing?
8/26	Consensus & Replication	Replication: Primary Backup and Chain Replication
8/28		Gossip Protocols and Epidemic Algorithms
9/2		No Class
9/4		FLP and Partial Synchrony
9/9		Paxos
9/11		Zookeeper/ ZAB
9/16		PBFT
9/18		Nakamoto Consensus

9/23		Proof of Stake in Ethereum
9/25	Local Storage	Recap on Filesystems / FFS
9/30		Log Structured Filesystems
10/3		LevelDB and WiscKey
10/7		PebblesDB
10/9		Rethink the Sync
10/14	Distributed Storage	Introduction to Storage Systems
10/16		CAP and Dynamo
10/21		C-Store
10/23		Serializabilty and Linearizability
10/28		Spanner
10/30		Coordination Avoidance
11/4		HyperDex
11/6		MapReduce
11/11		No Class
11/13	Virtualization	Xen
11/18		Containers (OpenLambda)
11/20		Firecracker
11/25		No Class
11/27		Arrakis
12/2		Demikernel
12/4		WebAssembly (Faasm)
12/9		Project Presentations