FA19: CS-249 Sec 01 - Distrib Computing

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San José State University

Science/Computer Science
SE/CS 249, Distributed Systems, Section 1, Fall 2019

Course and Contact Information

Instructor:	Ben Reed
Office Location:	MH 213
Telephone:	(408) 924-5174
Email:	ben.reed@sjsu.edu
Office Hours:	Monday & Wednesday* 10:00-11:00AM, 3:00-4:00PM Tuesday & Thursday 6:00-7:30PM * 10-11AM Wednesday office hour will be in Chicanx/Latinx Student Success Center Diaz Compean Student Union 1340 (across from Jamba Juice)
Class Days/Time:	Monday & Wednesday/ 12:00 - 1:15
Classroom:	MH 422
Prerequisites:	CS 149

Course Description

Current issues in operating systems, including multiprocessor systems and distributed computing, networks, security and performance. Case studies of current operating systems.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will:

1. Understand the terminology and common ideas of distributed computing.
2. Be able to explain fundamental ideas of distributed computing.
3. Gain experience with distributed computing principles in modern applications.

4. Understand some of the challenges present in a distributed environment.
5. Understand the differences between various solutions for distributed systems problems.

Required Texts/Readings

Textbook

No textbook.

Other technology requirements / equipment / material

Programming assignments will be a significant part of this course, so access to a computer is required.

Course Requirements and Assignments

Homework will be given, but will not be graded. It is intended for self-evaluation and will be the basis for future exams. I encourage students to work on homework in groups and discuss possible solutions together. We will take time at the beginning of each class to discuss any difficulties students have completing the homework.

I do not grade on a curve. The exams and projects measure what you are expected to have learned. There aren't many opportunities for extra credit apart from potential bonus questions on exams.

We will be doing individual programming assignments. Late submissions less than 24 hours late will have 10 points deducted from the final score. Submissions over 24 hours late will have 20 points deducted. **Individual programming assignments are not group projects.** If students get help on assignments, even to resolve a stupid problem, it must be documented in the code with the name of the person rendering the help and a brief description of the help provided. Extensive help on a project will result in a reduced grade. Failure to document help, or any other forms of cheating will result in a failing grade on the assignment at a minimum and may result in failure of the course. See **http://info.sjsu.edu/static/schedules/integrity.html (http://info.sjsu.edu/static/schedules/integrity.html)** for more information. Even in open source, you cannot copy code from one open source project to another without attribution.

Each student will present one paper during the class. The presentation should last around 30-40 minutes. To complement the presentation the student will also prepare homework for the paper. There should be around 10 homework questions that will measure the understanding of the key points of the paper. The presentation grade will be evaluated as follows:

Presentation coverage	20%
Correctness of presentation	20%
Does homework cover key points?	20%
Are homework questions understandable?	20%
Does presenter demonstrate good understanding of the paper?	20%

The University Policy S16-9 **(http://www.sjsu.edu/senate/docs/S16-9.pdf)**, Course Syllabi (http://www.sjsu.edu/senate/docs/S16-9.pdf) requires the following language to be included in the syllabus:

“Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.”

Final Examination or Evaluation

This course will have a cumulative final exam given during exam week.

There will be two in-class exams given in the semester (the last being the final exam :)).

Grading Information

Determination of Grades

Grades will be calculated by averaging the percentages of the average of project grades, the individual project grades, the one mid semester exams, and the final. Thus, the grade distribution is 25% individual projects, 25% exam 1, 25% final exam, 25% presentation.

Percentage	**Grade**
97 and above	A+
92-96	A
90-91	A-
88-89	B+
82-87	B
80-81	B-
78-79	C+
72-77	C
70-71	C-
68-69	D+
62-67	D

60-61	D-
59 and below	F

Classroom Protocol

This is your class. Please ask questions. Please come prepared. Do not engage in activity that may distract other students.

I do not take attendance except for the first two classes. Students not attending either of the first two classes will be dropped to make room for students on the waiting list. Attempting to get marked as present (by have someone else attend in your place or using technological deceptions) will be considered academic dishonesty and at a minimum will result in you getting dropped from the course.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page **(http://www.sjsu.edu/gup/syllabusinfo/)** at http://www.sjsu.edu/gup/syllabusinfo/" Make sure to review these policies and resources.

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Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	8/21/2019	intro to distributed systems. intro to Paxos:**https://lamport.azurewebsites.net/pubs/lamport-paxos.pdf (https://lamport.azurewebsites.net/pubs/lamport-paxos.pdf)**
2	8/26/2019	Paxos **https://lamport.azurewebsites.net/pubs/lamport-paxos.pdf (https://lamport.azurewebsites.net/pubs/lamport-paxos.pdf)**
2	8/28/2019	Lamport clock: **https://amturing.acm.org/p558-lamport.pdf (https://amturing.acm.org/p558-lamport.pdf)**

3	9/4/2019	Vector clocks: http://fileadmin.cs.lth.se/cs/Personal/Amr_Ergawy/dist-algos-papers/4.pdf (http://fileadmin.cs.lth.se/cs/Personal/Amr_Ergawy/dist-algos-papers/4.pdf)
4	9/9/2019	(proj assignment) ADB: https://groups.csail.mit.edu/tds/papers/Attiya/TM-423.pdf (https://groups.csail.mit.edu/tds/papers/Attiya/TM-423.pdf)
4	9/11/2019	Active disk paxos: https://groups.csail.mit.edu/tds/papers/Chockler/podc-02.pdf (https://groups.csail.mit.edu/tds/papers/Chockler/podc-02.pdf)
5	9/16/2019	quorum systems: https://arxiv.org/pdf/1608.06696v1.pdf (https://arxiv.org/pdf/1608.06696v1.pdf)
5	9/18/2019	FLP: https://groups.csail.mit.edu/tds/papers/Lynch/jacm85.pdf (https://groups.csail.mit.edu/tds/papers/Lynch/jacm85.pdf)
6	9/23/2019	CAP: https://users.ece.cmu.edu/~adrian/731-sp04/readings/GL-cap.pdf (https://users.ece.cmu.edu/~adrian/731-sp04/readings/GL-cap.pdf)
6	9/25/2019	ADB bakeoff
7	9/30/2019	wait free synchronization: http://dx.doi.org/10.1145/114005.102808 (http://dx.doi.org/10.1145/114005.102808)
7	10/2/2019	view stamp replication: http://pmg.csail.mit.edu/papers/vr-revisited.pdf (http://pmg.csail.mit.edu/papers/vr-revisited.pdf) (http://pages.cs.wisc.edu/~remzi/OSTEP/vm-intro.pdf)
8	10/7/2019	primary/backup:
8	10/9/2019	RSM: https://www.cs.cornell.edu/fbs/publications/SMSurvey.pdf (https://www.cs.cornell.edu/fbs/publications/SMSurvey.pdf)
9	10/14/2019	exam 1
9	10/16/2019	(proj) chain replication: https://www.cs.cornell.edu/home/rvr/papers/OSDI04.pdf (https://www.cs.cornell.edu/home/rvr/papers/OSDI04.pdf)
10	10/21/2019	concurrent objects: https://lamport.azurewebsites.net/pubs/interprocess.pdf (https://lamport.azurewebsites.net/pubs/interprocess.pdf)
10	10/23/2019	witnesses: http://www2.cs.uh.edu/~paris/MYPAPERS/Icdcs86.pdf (http://www2.cs.uh.edu/~paris/MYPAPERS/Icdcs86.pdf)

11	10/28/2019	order & agreement: http://www.cs.cornell.edu/lorenzo/papers/sosp03.pdf (http://www.cs.cornell.edu/lorenzo/papers/sosp03.pdf)
11	10/30/2019	chain replication bakeoff
12	11/4/2019	BFT: https://www.cs.princeton.edu/courses/archive/fall17/cos418/papers/bft.pdf (https://www.cs.princeton.edu/courses/archive/fall17/cos418/papers/bft.pdf)
12	11/6/2019	GFS: https://static.googleusercontent.com/media/research.google.com/en//archive/gfs-sosp2003.pdf (https://static.googleusercontent.com/media/research.google.com/en//archive/gfs-sosp2003.pdf)
13	11/13/2019	(proj) raft: https://web.stanford.edu/~ouster/cgi-bin/papers/raft-atc14 (https://web.stanford.edu/~ouster/cgi-bin/papers/raft-atc14)
14	11/18/2019	virtual synchrony:
14	11/20/2019	DHT: https://www.cs.princeton.edu/courses/archive/fall17/cos418/papers/chord.pdf (https://www.cs.princeton.edu/courses/archive/fall17/cos418/papers/chord.pdf)
15	11/25/2019	ceph: https://www.ssrc.ucsc.edu/Papers/weil-osdi06.pdf (https://www.ssrc.ucsc.edu/Papers/weil-osdi06.pdf)
16	12/2/2019	raft bake off
16	12/4/2019	map/reduce: https://static.googleusercontent.com/media/research.google.com/en//archive/mapreduce-osdi04.pdf (https://static.googleusercontent.com/media/research.google.com/en//archive/mapreduce-osdi04.pdf)
17	12/9/2019	percolator: https://ai.google/research/pubs/pub36726 (https://ai.google/research/pubs/pub36726)
Final Exam	Monday, December 16	0945-1200

Course Summary: