SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

NoSQL Database Systems

CS 157C

Fall 2026 Section 02 In Person 3 Unit(s) 08/19/2026 to 12/07/2026 Modified 08/19/2026

Contact Information

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  Preferred mode of contact is email.
- **Office Hours:** Tuesday and Thursday, 10:30 AM–11:30 AM in MH217 or on Zoom Meeting ID: 838 0090 4104

When you email me with a question, use **[Q]** in the subject line to receive a reply within a reasonable response time. For example:

Subject: [Q] lecture note

Course Information

- **Course:** CS 157C — NoSQL Database Systems
- **Semester:** Fall 2026
- **Section:** 02
- **Units:** 3
- **Instruction:** In person
- **Class Days/Time/Classroom:** Monday and Wednesday, 9:00 AM–10:15 AM, MH225
- **Course Prerequisite:** CS 157A (or a grade of C- or better)

This course involves a substantial amount of troubleshooting for system setup and deployment. Troubleshooting is entirely the student's responsibility. If this is something you do not expect from the course, you may reconsider taking it.

Class Format: Lectures are conducted **in person**; Zoom is used only for the **review at the beginning** and **poll at the end** of most classes. The Zoom meeting (Meeting ID: `838 0807 9643`) is accessed through Canvas. **Students must register for the Zoom meeting for their poll responses to be recorded.** None of these sessions will be recorded.

Course Description and Requisites

NoSQL Data Models: Key-Value, Wide Column, Document, and Graph Stores. CAP Theorem. Distribution Models. Current NoSQL Databases: Configuration and Deployment, CRUD operations, Indexing, Replication, and Sharding. Public Data Sets. API Coding and Application Development. NoSQL in the Cloud. Team Project.

Prerequisite(s): CS 157A with a C- or better. Computer Science or Software Engineering majors only.

Letter Graded

Classroom Protocols

Academic Integrity

- Any cheating on an exam will result in a grade of F in the class.
- If duplicate programs are found, both the provider and the copier will receive 0 points on the assignment. A second offense results in a grade of F in the class.
- Any incident of academic dishonesty will be reported to the University for disciplinary action.

Attendance

University Policy F15-12 states that:

“Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.”

Consent for Recording of Class and Public Sharing of Instructor Material

University Policy S12-7 requires students to obtain the instructor's permission to record the course.

Common courtesy and professional behavior dictate that you notify someone when you are recording them. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for private study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.

Course material cannot be shared publicly without the instructor's approval. You may not publicly share or upload instructor-generated material for this course, such as exam questions, lecture notes, or homework solutions, without instructor consent.

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

By the end of this course, students will be able to:

1. **Understand core NoSQL data models** and their fundamental characteristics.
2. **Compare NoSQL and relational database models** to evaluate strengths, limitations, and trade-offs.
3. **Explain distributed data management techniques**, including replication and sharding.
4. **Describe common NoSQL replication architectures**, such as master-slave and peer-to-peer systems.
5. **Understand consistency, availability, and partition tolerance** through Brewer's CAP Theorem.
6. **Apply NoSQL data management concepts**, including CRUD operations and querying mechanisms.
7. **Explain NoSQL system architectures**, including components and read/write communication paths.
8. **Select and apply appropriate NoSQL databases** to real-world application use cases.

Course Learning Outcomes (CLOs)

Upon successful completion of this course, students should be able to:

- Know the main NoSQL data models: key-value, column-family, document, and graph stores.
- Perform comparative analysis of NoSQL data models and the relational data model.
- Understand data distribution methods: replication and sharding.
- Understand master-slave and peer-to-peer replications.
- Understand Brewer's CAP Theorem and its implications for NoSQL database systems.
- Understand the essentials of NoSQL data management through CRUD operations and querying mechanisms.
- Understand NoSQL database system components and their communication protocols for the read and write process.
- Select an appropriate NoSQL database for the use case at hand and design applications to efficiently work with the chosen database.

Course Materials

Required Texts/Readings

- Textbook: None required
- The following references are available online through the SJSU library:
  - NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence by Parmod J. Sadalage and Martin Fowler
  - MongoDB: The Definitive Guide: Powerful and Scalable Data Storage, 3rd Edition by Kristina Chodorow, December 2020
  - The Definitive Guide to MongoDB: A Complete Guide to Dealing with Big Data using MongoDB, 3rd Edition by David Hows, Peter Membrey, Eelco Plugge and Tim Hawkins, December, 2015
  - Cassandra: The Definitive Guide: Distributed Data at Web Scale, 3rd Edition by Jeff Carpenter and Eben Hewitt, 2020
  - Mastering Apache Cassandra 3.x, 3rd Edition by Nishant Neeraj, Tejaswi Malepati and Aaron Ploetz, October 2018
  - Neo4j Graph Academy Links to an external site. (https://graphacademy.neo4j.com/)
  - Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement, 2nd Edition by Luc Perkins, Eric Redmond, and Jim Wilson, April 2018

Course Requirements and Assignments

Each class consists of a review of the previous class, a main lecture, and occasional quizzes conducted through Zoom polls.

Assignments

- 4–5 individual assignments are given, unless otherwise specified.
- A semester-long project using Neo4j is required.

Semester-Long Project Using Neo4j

The project consists of:

- **Individual Project:** Neo4j Graph Academy
- **Team Project:** A team of three students conducts the project.

The team project involves:

- Configuring and deploying a Neo4j database
- Populating data
- Programming using the API

Submission and Late Policy

- Any assignment or project submitted after the deadline will receive a penalty. For each late day, 20% of the maximum obtainable score of the work will be deducted from the score earned. A late day is one 24-hour period beyond the due date.
- For example, if the maximum score of an assignment is 100 and you earn 80 points, a submission that is two days late will receive a final score of $80 - (2 \times 20) = 40$.
- Any submission made more than 48 hours after the deadline will receive a grade of zero for that assignment.
- **Online submission via Canvas:** You may submit your work multiple times. The latest submission will be considered the final submission. If the final submission is late, the late policy will apply.
- Email submissions will not be accepted for grading.

Teamwork Policy

- Once a team is formed, it will remain together throughout the semester.
- If you dissolve your team, a significant amount of penalty will be determined by the instructor and given to both parties.
- For the team project, students are expected to submit a peer evaluation in addition to the final report.
- The responsibility and contribution of every team member must be precisely documented in the peer evaluation form.

Software

Students are responsible for setting up and deploying the required software products. The instructor may not be able to provide troubleshooting assistance.

Required software includes:

- MongoDB
- Cassandra
- Neo4j
- Docker
- Git
- Linux (Ubuntu)
- Programming Language: Java and/or Python

Course Workload

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) on instruction, preparation/studying, or course-related activities, including but not limited to internships, labs, and clinical practice. Other course structures will have equivalent workload expectations as described in the syllabus.

Exams

There will be one midterm exam and one comprehensive final exam. The exams are scheduled as follows. The midterm exam date is subject to change with fair notice, but the final exam date is firm and cannot be changed.

- **Midterm Exam (Take-Home Exam):** TBA
- **Final Exam (Online Exam on Canvas):** See the schedule below.

The Canvas exam must be taken **in the classroom** during the **scheduled class time for the final**. Exams taken remotely will **not** be accepted for credit.

There is no separate review for the final exam. In each class, the instructor reviews what was learned in the previous class. Students should make sure to get these reviews; the collection of these reviews will serve as the review for the final exam.

The instructor also often explicitly emphasizes particular topics during lectures because of their importance. Students should not miss these lectures, as the emphasized topics will greatly help them prepare for the final exam.

Proctoring Software and Exams

The final exam is given on Canvas and will be proctored through LockDown Browser.

Makeup Exam Policy

Absolutely no make-up exams will be offered under any circumstances.

For students who could not take the exam or who worked hard but received a low score on the exam, the following opportunity is available to replace the midterm score with the final exam score.

If the final exam percentage grade is higher than the midterm percentage grade, the midterm grade will be replaced by the final exam grade when computing the course grade.

For example, if you receive 60% on the midterm and 80% on the final exam, the 60% midterm grade will be replaced by the 80% final exam grade.

✓ Grading Information

The final grade is based on the weighted average of your performance. The grading weights are:

Component	Weight
Assignments	25%
Midterm	25%
Final Exam	32%
Project	15%
Participation (Zoom polls in class)	3%
Total	**100%**

Regrading

If you believe an error was made in the grading of your assignment or exam, you may request a regrade by speaking with the instructor during office hours or by sending me an email. Regrade requests must be made **within one week** of the date the assignment or exam grade is posted.

Letter Grade Determination

First, letter grades are normally assigned according to the following percentage scale:

Grade	Percentage
A+	97.0–100.0
A	93.0–96.9
A−	90.0–92.9
B+	87.0–89.9
B	83.0–86.9

Grade	Percentage
B–	80.0–82.9
C+	77.0–79.9
C	73.0–76.9
C–	70.0–72.9
D+	67.0–69.9
D	63.0–66.9
D–	60.0–62.9
F	0.0–59.9

However, if the overall class performance is too low for these standard cutoffs to be appropriate, the instructor may adjust the grading scale.

In that case:

1. The instructor will establish a C– cutoff that is below the overall class average but above 60%. This cutoff may be adjusted as needed.
2. Students whose overall scores are at or above the C– cutoff will be assigned letter grades from C– to A+ based on their performance relative to the class.
3. Students whose scores are below the C– cutoff will receive D+, D, D–, F, or WU, depending on their performance relative to the class.
4. The same grading method applies to all students enrolled in the course, including graduate students.

In short: the standard percentage scale will be used when appropriate. If overall class performance is significantly lower than expected, the instructor may use a curved grading system, with the C– cutoff serving as the dividing line between the higher letter grades and the lower grades.

University Policies

Per University Policy 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) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

Subject to change with fair notice.

Week	Topics
1	Course Orientation
1	Fundamentals of NoSQL
2	Fundamentals of NoSQL
2	Fundamentals of NoSQL
3	Fundamentals of NoSQL
3	Fundamentals of NoSQL
4	Introduction to MongoDB
4	Introduction to MongoDB
5	Introduction to MongoDB
5	MongoDB CRUD operations and Advanced Queries
6	MongoDB CRUD operations and Advanced Queries
6	MongoDB CRUD operations and Advanced Queries
7	MongoDB CRUD operations and Advanced Queries
7	MongoDB Replication
8	MongoDB Replication
8	MongoDB Replication
9	MongoDB Sharding
9	MongoDB Sharding
10	MongoDB Sharding
10	MongoDB Indexes
11	MongoDB Indexes
11	MongoDB Indexes
12	Introduction to Cassandra
12	CQL
13	CQL
13	CQL
14	Cassandra Data Modeling
14	Cassandra Data Modeling
15	Cassandra Architecture
15	Cassandra Architecture
Final	Section 02: Mon, December 14, 8:30-10:30 AM