Term: Fall 2025 **Subject:** Computer Science & Engineering (CSE) **Number:** 512

Course Title: Distributed **D**atabase **S**ystems (CSE 512)

Course Session

Days: Wednesday

Time: 4:30 PM – 7:15 PM

Location: Tempe – PSH150

Dates: 8/21/2025 – 12/05/2025

Instructor

Name: Bharatesh Chakravarthi, Ph.D.

Assistant Teaching Professor, CSE, SCAI

Office: BYENG M140 / Zoom Personal Meeting Room

Email: bharatesh@asu.edu

Office Hours: Thursday 4:30 – 5:30 PM**;** Students can meet the instructor outside of office hours by scheduling an appointment via email. Include [**CSE512**] at the start of the subject's line.

Teaching Assistant

Name: Kaustav Chanda

Email: kchanda3@asu.edu

Office Hours: To be updated.

Course Description

Distributed Database Systems (DDS) is a 3-credit course that offers a comprehensive exploration of managing data across interconnected databases. Includes topics such as distributed database architecture, design, parallel query processing and optimization, transaction management, concurrency control, deadlocks, and fault-tolerant mechanisms. Additionally, the course may explore modern database management in

cloud computing environments, Map/Reduce-based systems, and distributed NoSQL database systems such as Apache Cassandra/MongoDB/Apache HBase/Couchbase. The course emphasizes interactive learning through in-class discussions, requiring students to come prepared after doing the necessary readings. Practical assignments/exercises and projects complement theoretical knowledge, enabling students to develop expertise in designing and managing distributed databases. By the course's end, students gain valuable skills applicable to data management, cloud computing, and related fields, equipped to tackle challenges in large-scale distributed data systems.

Enrollment Requirements

Prerequisite(s): Computer Engineering or Computer Science or Data Science, Analytics & Engineering or Global Management (Data Science) or Robotics & Autonomous Systems (AI) or Software Engineering grad student; Credit allowed for only CSE 511 or CSE 512

For maximum effectiveness, Students are expected to have a foundational understanding of database systems, acquired through previous courses like CSE 412 and/or CSE 510. This includes familiarity with SQL query language, query processing, optimization, data storage, indexing, and transaction management concepts. Additionally, students should possess programming experience in high-level languages like C++, Java, and/or scripting languages such as Python. This background will enable students to engage effectively in the course material and practical assignments/projects.

Course Evaluation Components

- **Assignments and In-class activities:** Throughout the course, students will be required to complete three individual assignments and ten homework/in-class activities. These components will include programming-based problem statements and research-based exploration studies related to recent advancements in distributed database systems. Each assignment will be allotted a three-week time limit for completion.
- **Group Projects:** There will be one group project during the course, and each team can have a maximum of four members. A pool of project topics will be provided, and students can choose their preferred topic. The implementation platform, tools, and programming languages are open for student selection. For project submission, students must create a 3-minute video demonstrating their project implementation, an 8 to 10-page report describing the project, and the source code.
- **Midterm Exam:** The midterm exam will be conducted using a lockdown browser, and it will include multiple-choice questions in a quiz format, along with a programming question that must be solved within a fixed duration.

- **Final Exam:** The final exam will also be conducted using a lockdown browser and will consist of multiple-choice questions in a quiz format.
- **Quizzes:** Five unannounced quizzes will be held during lectures. Attendance in person is mandatory during such times.

By following these assessment components, students will have opportunities to demonstrate their understanding of distributed database systems and showcase their skills through individual assignments and collaborative group projects.

Grading Policy

Evaluation Component	Weightage
In-Class Activity	20%
Assignments (3)	30%
Group projects (1)	25%
Unannounced Quizzes (5)	05%
Midterm Exam	10%
Final Exam	10%

Grade	Upper limit percentage	Lower limit percentage
A+	100 %	to 97 %
A	< 97.0 %	to 94.0 %
A-	< 94.0 %	to 90.0 %
B	< 90.0 %	to 87.0 %
B+	< 87.0 %	to 84.0 %
B-	< 84.0 %	to 80.0 %
C+	< 80.0 %	to 76.0 %
C	< 76.0 %	to 70.0 %
D	< 70.0 %	to 60.0 %
E	< 60.0 %	

Course Plan

It is strongly recommended that students regularly visit the Canvas course page for any updates or modifications concerning assignments, In-class activities, quizzes, and group project schedules, as well as submission deadlines. The topics listed below are for reference purposes and are subject to change.

Course Plan CSE 512 – Distributed Database Systems Fall 2025				
Week (W)	**Date**	**Lecture Topic**	**Assignment (A) / Homework (HA)**	**Group Project (GP)**
W 01	8/21	Introduction to distributed database systems, architecture, and design principles.	HW01	
W 02	9/03	Hands-on Session	HW02	Project Team Finalization
W 03	9/10	Data fragmentation & replication.	HW03 A01 Release	
W 04	9/17	Distributed query processing and optimization, Parallel query processing.		
W 05	9/24	Data management in map-reduction systems.	HW04	Project Topics Pool Release
W 06	10/01	Distributed transaction management – concurrency control.	HW05 A01 Submission / A02 Release	Project Topic Finalization
W 07	10/08	Midterm Exam		Project Synopsis Submission
W 08	10/15	Distributed database reliability and fault tolerance.	HW06	
W 09	10/22	Hands-on Session	A02 Submission	
W 10	10/29	Replicated data management	A03 Release	
W 11	11/05	Big data systems, Data management in cloud computing environments.	HW07	
W 12	11/12	Hands-on Session	HW08	
W 13	11/19	Data management in blockchain.	HW09 A03 Submission	
W 14	11/26	Distributed NoSQL database systems.	HW10	Final Project Submission
W 15	12/03	**Final Exam**		

Course Policies – Assignments and Grading

- **Attendance and Participation**: It is highly recommended that you attend each class session. When you attend, please arrive on time, attend the full class period, and participate in the class activities. It is fine that participants (students) may need to occasionally miss a class session for personal reasons (e.g., religious holidays, family matters). In these situations, the student must contact the instructor to discuss alternative ways to grasp the information presented in the missed class session before the next class.
- **Late Submission Policy:** The due dates/times for all assignments are presented on the class schedule. Please note the dates/times carefully because there will be no provision for late submissions, except for extraordinary circumstances. Late submissions will receive no credit.
- **Makeup Exam Policy:** There will be no provision for make-up exams or assignments, except in extraordinary and documented circumstances.

Classroom Behavior Policy

- The students are required to behave courteously. The use of recording devices, without explicit permission, is not permitted during class. Any violent or threatening conduct concerning this class will be reported to the ASU Police Department and the Office of the Dean of Students.

Academic Integrity

- Students in this class must adhere to ASU's academic integrity policy, which can be found at https://provost.asu.edu/academic-integrity/policy. Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty can occur. In addition, all engineering students are expected to adhere to the ASU Academic Integrity Honor Code. All academic integrity violations are reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). The AIO maintains a record of all violations and has access to academic integrity violations committed in all other ASU colleges/schools. Specific academic integrity announcements for this class are:
    - You can discuss the assignments with other teams but all the submitted materials must be developed and prepared separately by the submitting student groups.
    - You should be able to explain and justify the materials you submit as a group.
    - Each team member should be able to describe their role in the submitted materials and show evidence for their work.
    - Recommend sanctions for these violations will be a 0 grade on the related deliverable and/or reporting the violation to the AIO for their decision.

Student Copyright Responsibilities

- Student must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the student first complies with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.
- The contents of this course, including lectures and other instructional materials, are copyrighted materials. Students may not share outside the class, including uploading, selling or distributing course content or notes taken during the conduct of the course. Any recording of class sessions is authorized only for the use of students enrolled in this course during their enrollment in this course. Recordings and excerpts of recordings may not be distributed to others. (see ACD 304–06, "Commercial Note Taking Services" and ABOR Policy 5-308 F.14 for more information).

Harassment and Sexual Discrimination

- Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment, and retaliation by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information.
- Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.
- As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling is available if you wish to discuss any concerns confidentially and privately. ASU online students may access 360 Life services at https://goto.asuonline.asu.edu/success/online-resources.html.

Change Notice

- Any information in this syllabus may be subject to change with reasonable advance notice.

Other Information

- If the instructor is absent from a class without prior notice, the students can leave after 15 min. Students may be directed to wait longer by someone from the academic unit if they know the instructor will arrive shortly