New Jersey Institute of Technology Department of Computer Science

CS 331 Database System Design & Management

The objective of the course is to introduce modern database systems. It focuses on the following issues: data models, conceptual data modes, the Entity-Relationship model, the Relational model, formal database query languages, the Relational algebra, the standard database language SQL, and indexing, formal database design theory, and functional dependencies and normal forms.

Students will learn how to design and create and then query and update a database through a final team project. They will get hands-on experience with modern database management systems using the standard database language - SQL.

Spring 2025 Section 006

Tue/Thu 8:30 – 9:50am, CKB 124 Prerequisite(s): Knowledge of set operations and data structures.

Instructor: Fatima Yusuf E-Mail: fatima.yusuf@njit.edu Zoom:https://njitedu.zoom.us/j/2089308953?pwd=bU XYRgyWAr1OK12YM07Fz4cYVrp zwT.1 Office: GITC 2124

Office Hours: Mondays 12:00 pm-1:00 pm Tuesdays 1:00 pm-4:00 pm And by Appointment

Grader: Meer Modi E-Mail: mnm23@njit.edu Meeting link: <u>https://meet.google.com/fdnooun-tfw</u> Office Hours:

Mondays 3:00 pm - 5:30 pm GITC 4325 Thursdays 1:30 pm – 3:30 pm GITC 4422

All Email communication between students and faculty should be accomplished using NJIT Email accounts.

Textbook(s):



Fundamentals of Database Systems, 7th

Course organization

- The slides for each lecture can be found on canvas. A good practice is to review pervious lectures and read from your book the material to be taught in class and to come prepared.
- Classwork assignments will be given regularly throughout the semester. You will work in groups, with each group assigned a different task to complete. One member from each group will present the group's work.
- Homework quizzes will be given weekly, covering selected topics.
- You will work in groups on a project which has three deliverables during the semester. A project demonstration is required for the last deliverable of the project.

Class Attendance

Class attendance is mandatory. Getting to class late or leaving early counts as half an absence.

Classroom Conduct Policies

- Make sure to bring your own device, laptop, to class to be able to complete given classwork.
- Turn off cell phones during class
- No surfing the Internet, instant messaging, visiting any social network, or engage in other activities that are not part of the class.
- Raise your hand and wait to be recognized
- Academic Integrity

Classwork/Participation

Asking and answering questions, as well as solving and submitting classwork assignments, are regular components of class meetings. Classwork assignments will be assigned frequently throughout the semester and will contribute to your class participation grade. You will work in groups, with each group assigned a different task. One member from each group will present the group's work to the class.

At the beginning of the semester, I will ask you to form groups of five people. You are expected to stay with the same group for the entire semester. Once your group is formed, please make sure you sit next to each other in each lecture. This will help avoid time lost in group formation, allowing you to discuss and complete your assigned tasks efficiently.

Late submissions will not be accepted, and all classwork must be completed during class time. Every group member is expected to actively participate in discussing and solving the assigned task to earn credit. Only students who attend class the day the classwork is assigned will receive participation points, except for special circumstances, such as jury duty or medical issues. In these cases, students must provide appropriate documentation to the Dean of Students.

General Database Textbooks

Raghu Ramakrishnan, Johannes Gehrke: Database Management Systems, 3rd Edition WCB/McGraw-Hill, © 2003.

Michael Kifer, Arthur Bernstein and Philip Lewis: *Database Systems: An Application- Oriented Approach*, Complete Version, 2nd Edition Addison-Wesley, © 2006.

Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 6th Edition McGraw-Hill , 2010.

C. J. Date: An Introduction to Database Systems, 8th Edition Addison-Wesley, © 2004.

Instructor's Syllabus Statement

This syllabus is subject to change due to student interests, special needs, cancellations, or instructor's decision.

Homework Quizzes

There will be weekly homework quizzes posted on canvas. You will have unlimited attempts, with only the last submission being counted. Note that if a quiz includes open ended questions, you will not see the score for those questions immediately upon submission. You will only be able to view your score for questions such as multiple choice, fill in the blank, etc.

All quizzes must be submitted by the deadline listed on canvas. Late Submissions will not be accepted except in special circumstances, such as medical issues. In such cases, you must provide documentation to the Dean of Students, and the final decision regarding acceptance will be made by the instructor.

Project

A project to design and implement a simple database system using a modern database management system will be assigned. It will proceed progressively through different steps and ultimately result in a well-designed, working relational database. The methodology for database development learned in class should be used. The project has three deliverables which together count 20% towards the final grade for the course. The third phase will include a final report and a working demonstration of your database.

Project Groups

Groups of at most 3 students are required. You can choose the classmates you want to work with. In order to form a group, you have to fill a form that will be available on Google drive. If you do not express any preference, I will put you in a group randomly.

Project phases

The project has three deliverables:

- An E/R diagram
- A Relational Schema
- A set of working SQL statements that demonstrate the creation, update, and use of the designed database. In addition,

the final report will demonstrate the proper analysis and design of the database in 3rd normal form. Each group must also to submit a video recording, with every member of the group participating, to demonstrating the final deliverable.

Project Submissions and Late policy

All project deliverables should be submitted on or before the day and time they are due through Canvas. Late submissions will not be accepted or will get penalties. A 10% deduction will be applied for each day the submission is delayed, and the minimum possible score, after deductions, is 50% of the original score. All components of the project must be submitted by the instructor-designated due date, which will be communicated. Submissions will not be accepted after this deadline.

Exams

There are two exams; the midterm and final exams. The midterm exam is on Thu, March 6th, and the date for the final exam to be determined.

There are NO makeup exams. If you miss the midterm exam due to a documented special circumstance, such as a medical issue, you may receive an imputed grade based on the final exam. The final decision will be determined by the instructor.

You must bring ID to all exams. Students with special needs are advised to make arrangements with the Office of Accessibility Resources and Services, Kupfrian Hall 201.

Grade Appeals

If you believe that you deserve more credit than you have been awarded on a particular exam problem, you may request, **at the time the exam is returned**, that it be regraded. Your entire exam will be regraded, which may result in points being added or subtracted.

Peer Tutoring

YWCC maintains an active program of peer tutors. The tutors for any course have received a grade of A for that course. Most of the undergraduate tutors offer assistance with CS 331. You can find a complete list of tutors and their availability at <u>Undergraduate Tutoring</u>. In addition, there is tutoring available for the graduate level of this course – CS 631. Any of those tutors should also be able to help for this course as well. The schedule is available at <u>Graduate Tutoring</u>.

Grading

Overall Course Score Formula

Attendance	5%
Classwork/participation	10%
Quizzes	10%
Project	20%
Midterm	25%
Final Exam	30%

The letter grade is based on the overall course score.

Grade Formula						
Grade	Α	B +	B	C+	С	D
Overall Course Score Cutoff	90	85	80	75	70	60

Course Outline
BASIC CONCEPTS - GENERALITIES ABOUT DATABASES
Introduction to databases. Database users
Database systems concepts and architecture. Data models.
CONCEPTUAL MODELING, DATABASE DESIGN
The Entity Relationship (ER) model
The Enhanced Entity Relationship (EER) model
THE RELATIONAL MODEL: CONCEPTS AND FORMAL QUERY LANGUAGES
Basic Definitions, Integrity Constraints, Update Operations
Relational Algebra
Relational Algebra Example Queries
FROM CONCEPTUAL MODELS TO LOGICAL MODELS
Mapping ER and EER diagrams to Relational schemas
SQL: A STANDARD DATABASE LANGUAGE
Data Definition, Basic Integrity Constraints, Schema Changes
Basic Queries
Complex Queries, Aggregate Functions and Grouping
Data Change Statements, Views and Complex Constraints
FORMAL DATABASE DESIGN THEORY
Functional dependencies (FDs), Inference of FDs, Normal Forms
DATABASE PHYSICAL ORGANIZATION
Indexing

Academic Integrity

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing, or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"

Collaboration and Individual Responsibility

You are encouraged to study and to work on assignments together with others; collaboration is a basic learning technique. You may not take credit for the work of others. All work that you represent as your own must, in fact, be your own. You must understand and be able to explain all work that you submit.

Accommodations

If you need accommodations due to a disability please contact the Office of Accessibility Resources & Services (OARS), Kupfrian Hall 201, to discuss your specific needs. A Letter of Accommodation Eligibility from the OARS authorizing your accommodations will be required.