New Jersey Institute of Technology
Department of Computer Science

CS 331 Data Management Systems Design

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, external hashing and indexing, formal database design theory, functional dependencies and normal forms, and transaction processing.

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.

Course (learning) outcomes

- Understand the data requirements of contemporary organizations and how database management systems meet them,
- Develop conceptual data model specifications,
- Design and implement database applications,
- Understand how data is stored, retrieved, and maintained in different types of databases,
- Gain experience with existing database management systems.

Fall 2025 Section 101
Mon 6:00pm – 8:50pm, Kupf 210
Prerequisite(s): Knowledge of C and data structures.

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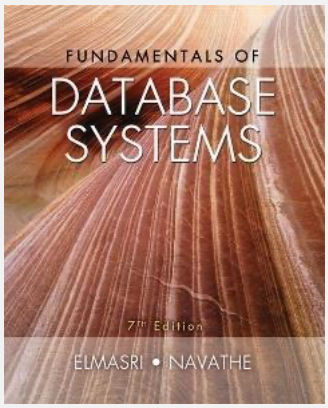
Office: GITC 2119

Office Hours: TF 2:30pm to 3:10pm

TA: TBD
E-Mail: TBD
Office Hours: TBD

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

Required Textbook(s):



Fundamentals of Database Systems, 7th Edition, R. Elmasri and S.B. Navathe Pearson, © 2016.

Here is the link to the fundamentals of DBMS book:
tdt4145/Fundamentals of Database Systems (7th edition).pdf at master · mariush2/tdt4145 · GitHub

Course organization

- The slides for each lecture are available before the class. A good practice is to read from your book the material to be taught in class and to come prepared.
- After the theory on a certain topic is presented, we will frequently work in class on corresponding exercises and discussions. A quiz will be gvien before the start of the lecture which will have questions from the previous lecture.

Attendance and Participation:

Class attendance is mandatory. If you have special circumstances that prevents from attending class, you must provide documentation to the dean of students for your absence to be excused.

Experience shows that students who do not attend classes do not perform well in the midterm and final exams. If you miss a class, be sure to consult one of your classmates about the content of the lecture and visit the course area in Canvas to get notes, exercises, assignments, and announcements.

Most classes will begin with a brief quiz on the topics covered in the previous class. These quizzes will count towards the course grade. See **Grading** below.

Classroom Conduct Policies:

- **Turn off cell phones during class**
- **No food or drink are allowed in class**
- **No surfing the Internet, instant messaging, or visiting any social network during lecture**
- **Raise your hand and wait to be recognized**
- **Academic Integrity is expected from everyone**

Communications with the Instructor

Communications with the instructor should be conducted via email (rk956@njit.edu) or on Canvas. I will strive to respond as quickly as possible. At a minimum, you should expect to hear back from me within one business day.

Recommended other books (not required):

Introductory

Jeffrey D. Ullman, Jennifer Widom: A First Course in Database Systems, 3rd Edition Prentice Hall, © 2008.

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

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.

Finally, Welcome. Explore your text options, make sure you have reliable technology, explore the online technology we will be using, and enjoy the adventure.

All emails **must** originate from an NJIT email account and include the Course and Section Number in the Subject line. Example:

Subject: CS331 002 Question regarding project deliverables

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 15% 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. If you do not express any preference, I will put you in a group randomly.

Exams

There are two mid term exams in this course and 1 Final. You must bring ID to all exams. Students with special needs are advised to make arrangements in advance with the Office of Accessibility Resources and Services (OARS). There are no makeup exams. If you miss an exam because of a documented special circumstance, you may receive a grade based on the other exam or based on the average performance on other parts of the course.

Extra Credit: There will be NO way to get extra credit. Please don't ask.
The department has voted on a stringent curve for all courses. Only the top 25% of the class should expect an A.
Furthermore, up to 20% of the class may face a C+, C, or F. Also note that most students typically get all the points on the Homework assignments. Thus, your position in the curve and your class grade depends almost entirely on the exams. On the other hand, missing a single homework is highly likely to lower your grade at least by one letter grade.

Submissions and Late policy

The homework assignments and all project deliverables should be submitted on or before the day and time they are due through Canvas. Every Canvas submission should be a SINGLE FILE in MS Word or PDF format only. **Late submissions will not be accepted or will get penalties.**

Grading

The midterm, homework, the project, and the final exam/quiz/discusions contribute to the course grade as follows:

	Percentage %
HomeWork1	5%
Mid Term1	15%
HomeWork2	5%
Mid Term2	15%
Project	15%
Final Exam	25%
Quiz	10%
Discussions	10%
Total	100%

The letter grade is based on the overall course score.

Grade Formula						
Grade	**A**	**B+**	**B**	**C+**	**C**	**D**
Overall Course Score Cutoff	90	80	70	60	45	40

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
FORMAL DATABASE DESIGN THEORY Functional dependencies (FDs), Inference of FDs, Normal Forms
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 Using SQL in an application - Db programming
DATABASE PHYSICAL ORGANIZATION File Organizations Indexing
TRANSACTION PROCESSING
SQL DATABASE PROGRAMMING

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 homeworks 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 Scott Janz, Associate Director of 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.

If students have health problems, mental problems, or family problems that will affect their performance negatively, they have to inform the Office of Accessibility Resources and Services (OARS) https://www.njit.edu/accessibility/ as soon as they become aware of the problems.