Data Management and Database Design
Fall 2025

Course Information
Course Title: Data Management and Database Design
Course Number: : DAMG 6210 SEC 08
Term and Year: Fall 2025
Credit Hour: 4
CRN: 17588
Course Format: On-Ground

Instructor Information
Full Name: Manuel D Montrond
Email Address: m.montrond@northeastern.edu
Office Hours: Monday and Wednesday 5-6PM

Instructor Biography
Manny Montrond, with over 20 years of experience in Information Technology, specializes in data management, enterprise architecture, and database technologies. His expertise includes implementing IoT systems, cloud-based NoSQL databases, and machine learning models, all of which have contributed to significant business growth and innovation. Manny holds an MBA from Boston University and a BS in Computer Engineering from the University of Massachusetts and has been teaching for over six years.

Teaching Assistants Information
TBD

Course Prerequisites
None
Course Description
Studies design of information systems from a data perspective for engineering and business applications; data modeling, including entity-relationship (E-R) and object approaches; user-centric information requirements and data sharing; fundamental concepts of database management systems (DBMS) and their applications; alternative data models, with emphasis on relational design; SQL; data normalization; data-driven application design for personal computer, server-based, enterprise wide, and Internet databases; and distributed data applications

Course Learning Outcomes
Learning outcomes common to all College of Engineering Graduate programs:

1. *An ability to identify, formulate, and solve complex engineering problems.*
2. *An ability to explain and apply engineering design principles, as appropriate to the program's educational objectives.*
3. *An ability to produce solutions that meet specified end-user needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.*

The Information Systems Program accepts students of different engineering backgrounds with minimum programming skills and produces first class Information Systems engineers that operate at the intersection of real-world complexity, software development, and IT management. Graduating students will be able to construct end-to-end advanced software applications that meet business needs.

Specific Learning Outcomes for the Information Systems program:
1. *Create a strong technical foundation through diverse, high-level courses.*
2. *Built crucial interpersonal skills needed to succeed in any industry.*
3. *Foster a deep level of applied learning through project-based case studies.*

Required Tools and Course Textbooks.

Books:
Jeffrey A. Hoffer, Ramesh, Heikki Topi
Modern Database Management Hoffer Database Management, 13th Edition
Prentice Hall, [ISBN-13: 978-0134773650]

Dusan Petkovic (2016)
Microsoft SQL Server 2016: A Beginner's Guide, Sixth Edition
McGraw Hill, [ISBN: 978-1259641794]

Software:
Students will need to download and install SQL Server database engine and SQL Server Management Studio to their local computers or in a cloud environment (Azure, Google, AWS etc.). The Developer Edition of SQL Server 2019/22 is recommended. Entity-Relationship Diagram (ERD) tool of your choice is mandatory. Recommended ERD tools include draw.io, ERWin, and Microsoft Visio.

Course Schedule/Topics Covered

Week	Date	Holiday	Deliverables	Topics	Readings
Week 1	9/8/2025			General Database Purpose and Development History	Chapter 1: *Database Environment and Development Process* (Hoffer, Ramesh, & Topi)
Week 2	9/15/2025		Team Formation	Entity–Relationship Modeling	Chapter 2: *Modeling Data in the Organization* (Hoffer, Ramesh, & Topi)
Week 3	9/22/2025		P1 – Topic Selection	Enhanced Entity–Relationship Modeling (EER)	Chapter 3: *The Enhanced E-R Model* (Hoffer, Ramesh, & Topi)
Week 4	9/29/2025			Conceptual and Logical Database Design: The Relational Model	Chapter 4: *Logical Database Design and the Relational Model* (Hoffer, Ramesh, & Topi), pp. 153–end of chapter
Week 5	10/6/2025		P2 – Conceptual Model	Conceptual and Logical Database Design: Data Normalization	*Data Normalization* (Chapter 4, Hoffer, Ramesh, & Topi), pp. 176–end of chapter
Week 6	10/13/2025	USA: Indigenous Peoples Day – No Class			
Week 7	10/20/2025		Mid-Term	Mid-Term	
Week 8	10/27/2025		P3 – Logical ER Model	Introduction to SQL / Data Definition Language / CRUD Operations	Chapter 5: *Introduction to SQL* (Hoffer, Ramesh, & Topi), pp. 207–end of chapter; Chapter 4: *SQL Components* (Petkovic); Chapter 5: *Data Definition Language* (Petkovic)
Week 9	11/3/2025			SQL Queries: Single Table Processing; Multiple Table Processing – Join, Subqueries, and Union	Chapter 6: *Advanced SQL* (Hoffer, Ramesh, & Topi), pp. 251–274
Week 10	11/10/2025		P4 – Schema Implementation	Persistent Stored Module: Stored Procedures and User-Defined Functions	Chapter 8: *Stored Procedures and User-Defined Functions* (Petkovic)

Week 11	11/17/2025			SQL/PSM: Triggers; Transparent Data Encryption	Chapter 6: *Advanced SQL* (Hoffer, Ramesh, & Topi), pp. 275–end of chapter
Week 12	11/24/2025		P5 – PSM Implementation	Concurrency Management / ACID Properties; Physical Database Design and Performance Optimization	Handouts and assigned readings from internet links
Week 13	12/1/2025		P6 – Final Presentation		
Week 14	12/8/2025		Final Exam	Final Exam	

Assignment Grading
Assignments balance between theory and practice and between individual and group work.

Assessment	% Grade
Mid-Term	15%
Final	20%
Participation	5%
Homework	10%
Quizzes	10%
Database project	30%
Lab	10%

Database Project

Students will form teams of four and develop a relational database based on reading and class lectures. The project will have the following deliverables:

Deliverable	% of grade

P1. Topic and Objectives	5
P2. Conceptual ERD	5
P3. Logical ERD	5
P4. Schema Implementation	5
P5. PSM Implementation	5
P6. Presentation	5
Total Project	30%

The rubrics for the project grading is Completeness 40%, Correctness 40%, and Creativity 20%.

Submission instruction:

Project submission instructions:

Please upload required project documents into Drive/GitHub and make the URL " public viewable " and share the URLs as Summary sheet (pdf or doc) on Canvas.

Your summary sheet should include links to all required documents submitted.

*One submission per team

P1. Topic and Objectives

Form a team of four members. Each team will collaborate to decide a database topic. The database topics may be like Book Store, University Registration, etc. Each team will also establish the mission statement and identify the mission objectives that the database will accomplish. The mission objectives may be like Book Sale, Inventory Control, etc.

P2. Conceptual Entity-Relationship Diagram (ERD)

Based on reading and class lectures, each team will create an initial Entity-Relationship diagram (ERD) that depicts a database for a real or fictitious business. This database will allow for data collection, processing, and reporting for an organization. It is strongly suggested that each team model a database for a type of organization that they have deep understanding---such as the current or previous work experience or a personal hobby. In the past, students have created databases to capture data about video rental stores, bike repair shops, beer tasting/review professionals, athletic leagues, and airlines. Students are encouraged to use their imagination!

Each team will submit an ERD for the database of their choosing. The target for the initial ERD is 10 entities or more. In addition to the ERD, students should submit a database design document containing the description of the business problems being addressed by their database, list all entities and how they are related to each other, and key design decisions.

For the part of the business problems being addressed, this section could be like the mission objective document completed earlier. Additionally, and more importantly, this document should contain your team's key database design decisions, such as why an entity is included and how that entity is related to other entities.

* Entity-Relationship Diagramming tool, Microsoft Visio or Toad Data Modeler can be downloaded for free. You may also use free tools such as: GitMind, Gliffy, Visual Paradigm, Draw.io, Lucidchart, SqlDBM, DBDiagram.io and QuickDBD

P3 - Logical Entity-Relationship Diagram (ERD)

Each team must refine their initial ERD based on the instructor's feedback. The updated design should focus on creating a **logical ERD**, incorporating improvements such as further normalization of database entities, reducing redundant data, and identifying additional entities where necessary.

In addition to the logical ERD, teams must submit a brief description that outlines the specific changes made from the initial ERD. The design document must also be updated to reflect these changes, although resubmission of the updated document is not required at this time.

The **logical ERD** must adhere to the following standards:

- No **multivalued attributes**.
- No **composite attributes**.
- No **many-to-many relationships** (all many-to-many relationships must be resolved).
- Every entity must include a **primary key** and the necessary **foreign keys** for relationships.
- The ERD must conform to **third normal form (3NF)** unless a specific and justified explanation for denormalization is provided.

This refined **logical ERD** should accurately reflect a fully normalized data model and adhere to these design criteria.

P4 – Schema Implementation

Each team is required to submit the SQL code necessary to implement the database design, including the insertion of a minimal amount of data (at least ten rows per table) using SQL INSERT statements or the Data Import Wizard.

Teams are expected to create the following database objects:

- At least three table-level CHECK constraints.
- Each table must have a primary key.
- Relationships between tables must enforce foreign key constraints.
- Appropriate rules, such as nullability, must be enforced.
- Each column should be assigned the appropriate data type.

- Include an identity column or equivalent mechanism for automatic ID generation.

P5 - PSM Implementation

Each team is required to submit the SQL code necessary to meet the database requirements. Teams are expected to create the following database objects:

- At least 3 stored procedures with input and output parameters.
- At least 3 views, often used for reporting purposes.
- At least 1 DML trigger.
- Computed columns based on a user-defined function (UDF), with the base table altered via DDL to enforce the calculation.
- Column data encryption.
- At least 3 non-clustered indexes.
- Data visualization using Power BI or Tableau.
- A graphical user interface (GUI) for CRUD operations is a plus (optional).

P6 -Project Presentation

Each team will present their database design project to the class. The presentation must cover the following key aspects:

1. **Project Overview**: Highlight the objective, scope, and purpose of the database project.
2. **ERD and Design Artifacts**: Present the finalized Entity-Relationship Diagram (ERD) and other key design documents.
3. **Implementation Highlights**: Share examples of key implementation details such as table schemas, sample DDL statements, or code snippets (e.g., stored procedures, views, triggers).
4. **Data Insights and Visualizations**: Demonstrate meaningful insights derived from the database using visualizations created with tools like Power BI, Tableau, or SSRS.
5. **Live Demo**: Showcase a live demonstration of the working database and its integrated visualization layer. 2 minutes max!

Grading Scale

95-100% A	87-89.9% B+	77-79.9% C+	
	84-86.9% B	74-76.9% C	
90-94.9% A-	80-83.9%B-	70-73.9% C-	
			69.9% or below F

Attendance/Late Work Policy

Attendance Policy

Students registered in MGEN courses (INFO, CSYE, and DAMG) are allowed **a maximum of 2 absences per course, with 3 or more absences resulting in an automatic 'F' for that course.** Students are expected to inform their instructors of any absences in advance of the class; if a student is sick long-term or experiences a medical issue that prevents class attendance, it is strongly encouraged that they speak with their Academic Advisor (coe-mgen-gradadvising@northeastern.edu) to learn more about the Medical Leave of Absence. Should a student anticipate being unable to attend 3 or more classes, they should discuss their situation with their Academic Advisor to explore other types of leave in accordance with the University's academic and global entry expectations. International students should review the Office of Global Services webpage to understand their visa compliance requirements.

Teaching Assistants (TAs) or Instructional Assistants (IAs) will be present at each class to collect student attendance.

Late Work Policy

Students must submit assignments by the deadline in the time zone noted in the syllabus. Students must communicate with the faculty prior to the deadline if they anticipate work will be submitted late. Work submitted late without prior communication with faculty will not be graded.

End-of-Course Evaluation Surveys
Your feedback regarding your educational experience in this class is particularly important to the College of Engineering. Your comments will make a difference in the future planning and presentation of our curriculum.

At the end of this course, please take the time to complete the evaluation survey at **https://neu.evaluationkit.com**. Your survey responses are **completely anonymous and confidential**. For courses 6 weeks in length or shorter, surveys will be open one week prior to the end of the courses; for courses greater than 6 weeks in length, surveys will be open for two weeks. An email will be sent to your Northeastern University Mail account notifying you when surveys are available.

Academic Integrity
A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to http://www.northeastern.edu/osccr/academic-integrity-policy/ to access the full academic integrity policy.

MGEN Student Feedback
Students who would like to provide the MGEN unit with anonymous feedback on this particular course, Teaching Assistants, Instructional Assistants, professors, or to provide general feedback regarding their program, may do so using this survey: https://neu.co1.qualtrics.com/jfe/form/SV_cTIAbH7ZRaaw0Ki

University Health and Counseling Services
As a student enrolled in this course, you are fully responsible for assignments, work, and course materials as outlined in this syllabus and in the classroom. Over the course of the semester if you experience any health issues, please contact UHCS.

For more information, visit https://www.northeastern.edu/uhcs.

Student Accommodations
Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit https://drc.sites.northeastern.edu.

Library Services
The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for education specific resources, visit https://library.northeastern.edu
Network Campus Library Services: Northeastern University Library Global Campus Portals

24/7 Canvas Technical Help
For immediate technical support for Canvas, call 617-373-4357 or email help@northeastern.edu

Canvas Student Resources: https://canvas.northeastern.edu/student-resources/

For assistance with my Northeastern e-mail, and basic technical support:
Visit ITS at https://its.northeastern.edu
Email: help@northeastern.edu
ITS Customer Service Desk: 617-373-4357

Diversity and Inclusion
Northeastern University is committed to equal opportunity, affirmative action, diversity, and social justice while building a climate of inclusion on and beyond campus. In the classroom, members of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration, and an awareness of global perspectives on social justice.

Please visit http://www.northeastern.edu/oidi/ for complete information on Diversity and Inclusion

Title IX
Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty, and staff.

In case of an emergency, please call 911.

*Please visit **https://www.northeastern.edu/ouec** for a complete list of reporting options and resources both on- and off-campus.*