Northeastern
College of Engineering

DAMG 6210: Data Management and Database Design
Fall 2025

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

Instructor Information
Full Name: Syed Farhan Mazhar
Email Address: s.mazhar@northeastern.edu

Instructor Biography

Syed Farhan Mazhar has over 18 years of experience in both the service provision industry and academia, where he has held leadership positions. He has a deep passion for teaching and has served as a permanent and visiting faculty member at several reputable higher education institutions, both locally and internationally. His teaching portfolio covers a wide range of subjects, including Computer Science, Software Engineering, Database Systems, Programming Languages, and Project Management.
Syed holds a Master's degree in Software Engineering with a specialization in Intelligent Systems from the University of Alberta, an M.Sc. in Electronics from Karachi University, and is currently a PhD candidate in Computer Science at McMaster University. He has also completed numerous international certifications and training programs, including PMP (Project Management Professional) from PMI, Oracle Certified Professional from Oracle, ITIL Foundations, A+ certification, Mini MBA courses, and Advanced Teaching and Learning Certificates.
His recent research interests focus on managing IT projects, discrete-event systems (including fault diagnosis and detection), formal verification of hardware and software, business process design, data analytics, data cleaning, and database systems.

TA Information:
Name: Siddharth Bahekar
Email: bahekar.si@northeastern.edu

Course Prerequisites
N/A

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.

This course provides insights from a data perspective for engineering and business applications; data modeling, Relational Algebra, 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; SQL Injection and distributed data applications.

Standard 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:

- *Create a strong technical foundation through diverse, high-level courses*
- *Built crucial interpersonal skills needed to succeed in any industry*
- *Foster a deep level of applied learning through project based case studies*

Course Outcomes and Assessment Standards

Upon successfully completing the course, students will be able to conduct the following:

- describe the rationale for designing and deploying database management systems
- explain the differences between Relational Database Management Systems and NoSQL Database Management Systems
- communicate the various forms of data integrity (domain, entity and referential)
- define the process of developing a fully-normalized database design
- explain the structural components of databases (entities, attributes, data types & indexes)
- perform queries and analysis of data using SQL programming language
- articulate concepts of ACID properties and principles of transaction management
- describe legal and ethical issues related to data privacy and ownership

- Understand Data Modeling Principles: Students will be proficient in data modeling techniques, including entity-relationship (E-R) and object-oriented approaches, to design effective information systems for engineering and business applications.
- Master Relational Database Concepts: Students will gain a comprehensive understanding of fundamental concepts of relational database management systems (DBMS), relational algebra, SQL, and data normalization; and be able to apply these concepts to design and implement relational databases.
- Design Data-Driven Applications: Students will be equipped with the skills to design data-driven applications tailored to various computing environments, including personal computer, server-based, and Internet databases.
-

Text Books.

Database Systems Design, Implementations and Management- 13th Edition

- By Carlos Coronel, Steven Morris, Peter Rob.

Reference Books

- Database Management Systems bb Raghu Ramakrishnan, Johannes Gehrke.
- Modern Database Management Hoffer Database Management effrey A. Hoffer, V.Ramesh, Heikki Topi

These textbooks have been selected because of their breadth and depth of coverage of databases. They are well written and contain many examples. Students should find these books to be useful for several years to come.

Required Tools and Course Textbooks.:

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

LATE WORK

All assignments must be submitted to the class Blackboard site for the course on the due date before 11:59 pm. If you turn in an assignment late, 10% credit will be deducted from the total score for each day after the deadline. **Assignments turned in more than one week late will not receive credit. In the case of unexpected events, you must contact the instructor before the assignment due date in order to receive a grace period.**

Course Schedule/Topics Covered

Week and Date	Deliverables	Topics	Readings
WK-1 (09/08/2025)		General Database Purpose and Development History	Chapter 1: "Database Environment and Development Process" (Hoffer,Ramesh, & Topi)

WK-2 (09/08/2025)	Team Formation	Entity–Relationship Modeling	Chapter 2: "Modeling Data in the Organization" (Hoffer, Ramesh, &Topi)
WK-3 (09/15/2025)	P1 - Topic Selecti on	Enhanced Entity–Relationship Modeling (EER)	Chapter 3: "The Enhanced E-R Model" (Hoffer, Ramesh, & Topi)
WK-4 (09/22/2025)		Conceptual and Logical Database Design: The RelationalModel, Data Normalization	Chapter 4: "Logical Database Designand the Relational Model" (Hoffer, Ramesh, & Topi) pg 153 - end of chapter
WK-5 (09/29/2025)	P2 - Initial ERModel	Introduction to SQL and SQL Queries: Single Table Processing	Chapter 5: "Introduction to SQL" (Hoffer, Ramesh, & Topi) from pg207 - end of chapter Chapter 4: "SQL Components" (Petkovic) Chapter 5: "Data DefinitionLanguage" (Petkovic)
WK-6 (10/06/2025)			
WK-7 (10/13/2025)	Mid-Term	Mid-Term	
WK-8 (10/20/2025)	P3 - Logical ER Model	SQL Queries: Multiple Table Processing: Join, Subqueries, and Union	Chapter 6: "Queries" (Petkovic) Chapter 6: "Advanced SQL" (Hoffer,Ramesh, & Topi) page 251-274

WK-9 (10/27/2025)		Persistent Stored Module: Stored Procedures and User-Defined Functions, SQL/PSM: Triggers	Chapter 6: "Advanced SQL" (Hoffer,Ramesh, & Topi) from page 275 - end of chapter Chapter 8: "Stored Procedures and User-Defined Functions" (Petkovic)
WK-10 (11/03/2025)	P4 - Schema Implementation		
WK-11 (11/10/2025)		Transparent Data Encryption Concurrency Management / ACID Properties	Handouts and assigned readings
WK-12 (11/17/2025)	P5 - PSM Implementation	Physical Database Design and Performance	Handouts and assigned readings
WK-13 (11/24/2025)	Final Exam	Final Exam	
WK-14 (12/01/2025)	P6 - Final Presentation	Final Presentation	

EVALUATION:

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

Assessment	**% Grade**
Ind Lab Exercises	20%
Midterm	15
Discussion	5%
Database project	30%
Final Exam	30%

DATABASE PROJECT

Students will form teams of 4 and develop a relational database based on reading and class lectures. The project will have the following deliverables:

Grading Scale

Please note: This is the department's standardized grading scale. While we understand that some classes may apply a curve, faculty must establish and include a clear grading scale within the syllabus, regardless of the chosen grading method.

Percentage Range	Letter Grade	Grade Point Equivalent
95.0–100.0%	A	4.000
90.0–94.9%	A-	3.667

87.0–89.9%	B+	3.333
84.0–86.9%	B	3.000
80.0–83.9%	B-	2.667
77.0–79.9%	C+	2.333
74.0–76.9%	C	2.000
70.0–73.9%	C-	1.667
69.9% and Below	F	0.000

Incomplete Grades

An incomplete grade may be reported by the instructor when a student has failed to complete a major component of a required course, such as homework, a quiz or final examination, a term paper, or a laboratory project. Students may make up an incomplete grade by satisfying the requirements of the instructor. Be aware that instructors' policies on the granting of incomplete grades may vary and that the final decision on an incomplete grade is up to the instructor. **Instructors may deny requests for an incomplete grade.** If the missing assignment(s) have not been submitted to the instructor within 30 days from the end of the term in which the course was offered, or the agreed upon due date, the grade entered will reflect the student's grade in the course for the work completed and the missing assignments receiving no credit toward the final grade.

Attendance/Late Work Policy
Attendance Policy

In each term, students enrolled in on-ground sections are expected to be on campus and attending class beginning with the first day of classes. Students in online sections are expected to log in and participate in class beginning with the first day of classes.

Students who join a class after the first day of class during the university add period, or who are approved for late registration by the instructor and the Graduate School of Engineering, are responsible for all coursework missed prior to enrolling. In the interest of students' success, the college does not support the arrival of students to class after the university add deadline. **Enrolled students who do not attend class during the first week of a semester risk being dropped from the course.**

In cases where an enrolled student cannot arrive to campus by the first day of class due to circumstances beyond their control, it is the student's responsibility to contact the instructor for approval and notify the Graduate School of Engineering.

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 'F' for that course. Course instructors are not expected to make accommodations and students are expected to inform their instructors of any absences in advance of the class. 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 and accommodations in accordance with the University's academic and global entry expectations. Students may be asked to share communications about class absences with their Academic Advisor. 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-gradadvising@northeastern.edu) to learn more about the Medical Leave of Absence. 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.

Course Evaluations

Student feedback on their learning experience is valuable and helps improve future courses. We encourage all students to complete the course evaluation surveys when they become available.

Surveys are distributed at both the midterm mark and the end of the term via email and are completely anonymous and confidential. Any questions about the surveys can be directed to mgen-programs@coe.northeastern.edu

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

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.

The following is a broad overview, but not an all-encompassing definition, of what constitutes a violation of academic integrity:

Cheating: The University defines cheating as using or attempting to use unauthorized materials, information, or study aids in any academic exercise. When completing any academic assignment, a student shall rely on their own mastery of the subject.

Fabrication: The University defines fabrication as falsification, misrepresentation, or invention of any information, data, or citation in an academic exercise.

Plagiarism: The University defines plagiarism as using as one's own the words, ideas, data, code, or other original academic material of another without providing proper citation or attribution. Plagiarism can apply to any assignment, either final or drafted copies, and it can occur either accidentally or deliberately. Claiming that one has "forgotten" to document ideas or material taken from another source does not exempt one from plagiarizing.

Unauthorized Collaboration: The University defines unauthorized collaboration as instances when students submit individual academic works that are substantially similar to one another. While several students may have the same source material, any analysis, interpretation, or reporting of data required by an assignment must be each individual's independent work unless the instructor has explicitly granted permission for group work.

Participation in Academically Dishonest Activities: The University defines participation in academically dishonest

activities as any action taken by a student with the intention of gaining an unfair advantage over other students.

Facilitating Academic Dishonesty: The University defines facilitating academic dishonesty as intentionally or knowingly helping or contributing to the violation of any provision of this policy.

Please visit https://osccr.sites.northeastern.edu/academic-integrity-policy/ to access the full academic integrity policy.

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/Disability Access Services (DAS)
Northeastern University and the Disability Access Services (DAS) 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, students must provide appropriate documentation as provided by the DAS office.

If the course is conducted in an on-ground (in-person) format, students are expected to attend class physically as scheduled. Professors are **not required to provide virtual attendance links** unless a student has documented accommodation approved by the **Disability Access Services (DAS) office** and their **Academic Advisor**. If a student requires accommodation for remote participation, they must submit a formal request through the **Disability Office** and coordinate with their **Academic Advisor** prior to the course start date.

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

Office of Global Services
As an F-1, J-1, or Study Permit student, you must meet certain obligations in order to maintain lawful nonimmigrant status. Maintaining status is necessary in order to retain eligibility for the benefits of F-1 or J-1 status, such as employment authorization and program extension, and can be crucial to a successful application for a change or adjustment of nonimmigrant status in the future. Failure to maintain your nonimmigrant status can result in serious problems with immigration and *could lead to deportation from the U.S. or Canada.*

Students must maintain on-ground presence throughout the academic term. At Northeastern, there are four different defined instructional methods: Traditional, Hybrid, Live Cast, and Online. Traditional, Hybrid, and Live Cast courses meet the Visas' on-ground presence requirements. **Online courses do not meet the Visas' on-ground presence requirements.**

Students enrolled in Summer courses should adhere to OGS guidelines on maintaining status during the Summer term.

For more information please visit, https://international.northeastern.edu/ogs/current-students/understanding-visa-requirements/guidelines-on-maintaining-status/

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: 617-373-43