DAMG 6210 Data Management and Database Design
FALL 2024

Course Information
Course Title: Data Management and Database Design Course
Number: DAMG 6210
Term and Year: Fall 2024
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:
Full Name: Sujiitra Murukeshan
Email Address: murukeshan.s@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.

At the end of this course student will have through hands on experience on SQL, Dynamic SQL, PL/SQL and Advanced topics.

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

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

Date	Deliverables	Topics	Readings
9/9/2024		General Database Purpose and Development History	Chapter 1: "Database Environment and Development Process" (Hoffer,Ramesh, & Topi)
9/16/2024	Team Formation	Entity–Relationship Modeling	Chapter 2: "Modeling Data in the Organization" (Hoffer, Ramesh, &Topi)
9/23/2024	P1 - Topic Selection	Enhanced Entity– Relationship Modeling (EER)	Chapter 3: "The Enhanced E-R Model" (Hoffer, Ramesh, & Topi)

9/30/2024		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
10/7/2024	P2 - Initial ER Model	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)
10/14/2024			
10/21/2024	Mid-Term	Mid-Term	
10/28/2024	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

Date	Deliverable	Topic	Reading
11/4/2024		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)
11/11/2024	P4 - Schema Implementation		
11/18/2024		Transparent Data Encryption Concurrency Management / ACID Properties	Handouts and assigned readings
11/25/2024	P5 - PSM Implementation	Physical Database Design and Performance	Handouts and assigned readings
12/2/2024	Final Exam	Final Exam	
12/9/2024	P6 - Final Presentation	Final Presentation	

EVALUATION:

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

Assessment	% Grade
Ind Lab Exercises	30%
Discussion	10%
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

	87-89.9% B+	77-79.9% C+	
	84-86.9% B	74-76.9% C	
95-100% A			
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*