Databases

Fall 2021

COURSE GOALS

This course presents how to design a relational database from requirements gathering, to conceptual and logical modeling. We also cover how to query databases using SQL, the ACID properties of a relational database management system, and fundamentals of database programming using triggers, stored procedures, functions, and events. Advanced topics include indexing, transactions, concurrency and recovery. The course will also provide an introduction to non-relational (NoSQL) databases.

Lectures

Will focus on developing a conceptual understanding of database design & usage, as well as DBMS implementation.

Assignments

Will ask students to apply their conceptual knowledge via problems and code implementation. There will be ~10 assignments one per week with a quiz typically scheduled shortly after assignments are due

Team Project

Students are encouraged to form teams of one to four members to collaborate on a team project due at the end of the semester. The team project will allow students to collaboratively complete an application from start to finish, including design & creation/optimization within a DBMS, as well as a programmatic user-interface. The goal of the project is to gain hands-on experience with developing a full database application from the ground up

MEETING

Lectures will be in person on the dates and times listed below. It is expected that students attend in person. Lectures will also be held live and recorded on Zoom and you can join using the Zoom link below. Recorded lectures will be available through the Zoom link on Canvas and are provided as a convenience and not as an alternative to come to class, and should not be "bing watch". There will be time sensitive content in the lectures you will be responsible for.

Live lecture expected to attend	Mondays @ 6:00 - 9:00pm (EST)
Optional online lecture	https://northeastern.zoom.us/j/98320173895
Office hours	https://northeastern.zoom.us/j/2963867602 online @ 3:30pm
Piazza	https://piazza.com/class/kt7zqbbiicu6ma

INSTRUCTION TEAM

Office hours will be held online on Zoom at the following days and times. We will be using Pizza for discussions. If you have a question please start there since other students might have had the same exact question. Piazza link: https://piazza.com/class/kt7zqbbiicu6ma. If you need one on one help the TAs and myself will be holding office hours following the schedule below on Zoom

Instructor/Email	Office Hours	Zoom
Jose Annunziato j.annunziato@northeastern.edu	Tue & Fri 3:30pm (EST)	https://northeastern.zoom.us/j/2963867602
Madhav, Nesara madhav.n@husky.neu.edu	Mon & Wed 11:00 am - 1 pm (EST)	https://northeastern.zoom.us/my/**nesara**
Shi, Ying shi.yi@northeastern.edu	Mon & Wed 9:00 am (EST)	https://northeastern.zoom.us/j/7280106688
Vellingiri Thirunavukkarasu, Abirami vellingiri.a@northeastern.edu	Wed 11:00 am & Thurs 9:00 am (EST)	https://northeastern.zoom.us/j/93369477592

AGENDA

Week	Dates	Topics		Exams	HWs	Due
1	9/13	Installing a database	Introduction, Installing MySQL & Workbench, Creating a database		DB1	9/20
			Creating a table, Inserting data, Selecting data, Exporting the database			
2	9/20	Designing a database	UML, class diagrams, requirements		DB2	9/27
			Text to UML, UML to text, Relational Algebra			
3	9/27	Creating a database	Create tables, inheritance, portable enums	Q1	DB3	10/4
			Constraints, Functional Dependency, Normal Form			
4	10/4	Querying a database	Select From Where, Join	Q2	DB4	10/11
			Group By, Having, Union			
5	10/11	Updating a database	Inserting, Updating and Deleting from Databases	Q3	DB5	10/18
			Cascade deletes, updating Views			
6	10/18	Programming a database	Functions, Stored Procedures and Triggers	Q4	DB6	10/25
			Java Database Connectivity			
7	10/25	Review	Exam Review, Project Review			
		Exam 1				
8	11/1	ORM	Java Persistence API	Q5	DB7	11/8
			Web Services			
9	11/8	Data drive	Client Server Architecture	Q6	DB8	11/15

		Web apps	JavaScript clients and React.js			
10	11/15	Optimizing a database	Transactions	Q7	DB9	11/22
			Indexing			
11	11/22	NoSQL databases	MongoDB, Mongoose	Q8	DB10	11/29
			Firebase			
12	11/29	Project	Create project schema, tables, insert data		P1	12/6
		Thanks giving	One to Many, Many to Many, queries			
13	12/6	Project	Models, repositories, DAOs	Q9	P2	12/13
			React front end			
14	12/13	Review	Last Class			
		Exam 2	Project Due			
15	12/20	Grades due				
	12/21	myNEU				

EVALUATION

The final grade for this course will be weighted as follows...

- Assignments (~10): 40%
- Quizzes (~8): 10%
- Project: 30%
- Exam 1: 10%
- Exam 2: 10%

Final grades will be assigned based on the following scale

- A 94 - 100
- A- 90 - <94
- B+ 87 - <90
- B 84 - <87
- B- 80 - <84
- C+ 77 - <80
- C 74 - <77
- C- 70 - <74
- D+ 67 - <70
- D 64 - <67
- D- 60 - <64
- F <60

Make-Up Policy

All assignments and project milestones are due at midnight on their due date. Late submissions will be penalized one percent for every hour late. For example, an on-time submission might receive a grade of 90 points. The same assignment submitted 5 hours after the deadline would be deducted 5 points and receive an

85. Students who miss scheduled quizzes or exams will not, as a matter of course, be able to make up those exams. If there is a legitimate reason why a student will not be able to complete an assignment on time or not be present for an exam, then they should contact the instructor beforehand. Under extreme circumstances, as decided on a case-by-case basis by the instructor, students may be allowed to make up assignments or exams without first informing the instructor. Assignments might have bonus options that can be completed at any time to compensate for missed work.

Assignments

Submissions will be made via Blackboard and GitHub Organization accounts, to which the students will be given access to. Each assignment will have instructions on what to submit, but generally students are expected

- To commit their project/assignment/homework in their GitHub account.
- Submit their github url to their Blackboard account.
- Mandatorily provide instructions on how to execute their work in README.md document.

Code is expected to be professional and properly documented

- Any required data files and library dependencies must be resolvable via pom.xml or package.json files.
- All source code must be available through the school's github repository.
- Instructors must be able to clone your repository, build, and run your project from their local environments.

This class has very strict standards for borrowing code:

- if you borrow anything for use in your assignment/project, you must have a citation. A good guideline is that if you take more than three lines of code from some source, you must include the information on where it came from. A URL or a notation (e.g., "MATLAB help files") is fine.
- If it is an entire function, note it at the beginning of the code segment and include any original credit information. Provide a qualitative description of what you used, and what you changed/contributed.
- If you have a question about what is considered a violation of this policy, ASK!

The university's academic integrity policy discusses actions regarded as violations and consequences for students: http://www.northeastern.edu/osccr/academic-integrity

READING

Students are expected to read the materials or view assigned videos in preparation of each lecture.

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.

Read the policy describing definitions and consequences of Cheating, Fabrication, Plagiarism, Plagiarism, and other details regarding Academic Integrity Policy

CLASSROOM ENVIRONMENT

To create and preserve a classroom atmosphere that optimizes teaching and learning, all participants share a responsibility in creating a civil and non-disruptive forum for the discussion of ideas. Students are expected to conduct themselves at all times in a manner that does not disrupt teaching or learning. Your comments to others should be constructive and free from harassing statements. You are encouraged to disagree with other students and the instructor, but such disagreements need to respectful and be based upon facts and documentation (rather than prejudices and personalities). The instructor reserves the right to interrupt conversations that deviate from these expectations. Repeated unprofessional or disrespectful conduct may result in a lower grade or more severe consequences. Part of the learning process in this course is respectful engagement of ideas with others.

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.

If you or someone you know has been a survivor of a Prohibited Offense, confidential support and guidance can be found through University Health and Counseling Services staff (http://www.northeastern.edu/uhcs/) and the Center for Spiritual Dialogue and Service clergy members (http://www.northeastern.edu/spirituallife/). By law, those employees are not required to report allegations of sex or gender-based discrimination to the University.

Alleged violations can be reported non-confidentially to the Title IX Coordinator within The Office for Gender Equity and Compliance at: titleix@northeastern.edu and/or through NUPD (Emergency 617.373.3333; Non-Emergency 617.373.2121). Reporting Prohibited Offenses to NUPD does NOT commit the victim/affected party to future legal action.

Faculty members are considered "responsible employees" at Northeastern University, meaning they are required to report all allegations of sex or gender-based discrimination to the Title IX Coordinator.

In case of an emergency, please call 911.

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

Students With Disabilities

Students who have disabilities who wish to receive academic services and/or accommodations should visit the Disability Resource Center at 20 Dodge Hall or call (617) 373-2675. If you have already done so, please provide your letter from the DRC to me early in the semester so that I can arrange those accommodations.