NYU | ROBERT F. WAGNER GRADUATE SCHOOL OF PUBLIC SERVICE

PADM-GP 4504.001

Introduction to Database Design, Management, and Security
Spring 2023

Instructor Information

- Poranee (Pam) Kingpetcharat
- Email: pk1030@nyu.edu •
  Office Hours:
  - Monday – Friday [10am – 5pm] use my work calendar link https://calendly.com/pkingpetcharat-1
  - Saturday, Sunday and after 6pm:
    - ✦ Please email me your day & hours that work best for you so I can select quickly from options

Course Information

- Class Meeting Times: Wednesdays, 4:55-6:35pm
- Class Location: Tisch Hall, Room LC5 Loc: Washington Square

Course Prerequisites

Students planning to enroll for this course should be comfortable with the fundamentals of programming and basic data structures. This course prepares students to build and administer a database and covers representing information with the relational database model, manipulating data with Structured Query Language (SQL), database design, and database security, integrity, and privacy issues.

Course Description

The goal of this course is to train advanced students on the principles, practices, and technologies required for good database design, management, and security. An introduction to the concepts and issues relating to data warehousing, governance, administration, security,

privacy and alternative database structures will be provided. The course concentrates on building a firm foundation in information organization, storage, management, and security.

Course and Learning Objectives

Students will be able to:

- Explain the value of databases, importance of database architecture, considerations for data integration, and provide an overview of database tools and trends.
- Learn the management policies, practices, and procedures required for maintaining information integrity, security, and privacy.
- Apply concepts and practices to database design and implementation.

Learning Assessment Table

Graded Assignment	Course Objective Covered
Attendance	All
Exit ticket surveys	All
Readings Quizzes	#1, #2
Problem Set #1	#1, #2
Problem Set #2	#1, #2
Final Project	#3

Readings

Hernandez, Michael J. (2013), Database Design for Mere Mortals: A Hands-On Guide to Relational Database Design, Boston, MA: Addison-Wesley Professional.

Gillenson, Mark L. (2011), Fundamentals of Database Management Systems, Hoboken, New Jersey: Wiley.

Davenport, Thomas (2014), Big Data at Work: Dispelling the Myths, Uncovering the Opportunities, Cambridge, MA: Harvard Business Review Press

Lane, Julia; Stodden, Victoria; Bender, Stefan (2014), Privacy, Big Data, and the Public Good: Frameworks for Engagement, New York, NY: Cambridge University Press.

This course will make use of these books to frame our hands-on application of the creation, navigation, and management of a PostgreSQL database. Database Design for Mere Mortals: A Hands-On Guide to Relational Database Design introduces relational databases, terminology, outlines the importance of design, and considerations for avoiding bad design. Fundamentals of Database Management Systems provides an overview of the policies and practices required for maintaining data integrity and systems health. Big Data at Work: Dispelling the Myths, Uncovering the Opportunities provides an overview of the trends in Big Data and the corresponding technologies emerging to address those trends. Finally, Privacy, Big Data, and

the Public Good provides a framework for thinking about the trade-offs associated with data privacy, what that looks like with respect to cities, and a historical evolution of EU data privacy laws' impact on research. Additional readings drawn from academic & business journals and news sources will also be used to encourage in class discussion, illustrate principles, and facilitate learning.

Assessment Assignments and Evaluation

Attendance, Exit Ticket submissions, and Reading Quizzes (25%):

Students are required to attend all classes and contribute to classroom discussion. Please email Professor if you'll be missing class, to obtain an excused absence. Students will have up to 5 days to complete an Exit Ticket after each class. If a student obtained an excused absence, they will receive an automatic credit for that class' Exit Ticket. There will be at least 2 Readings Quizzes that will assess student comprehension of key take-aways from the readings assigned.

Problem Sets (25%):

Problem Set #1 and Problem Set #2 are worth 25% of your course grade. Problem Sets will be graded on a 100-point scale based on completeness, correctness, and timeliness.

Final Project (50%):

The production of the deliverable from this Final Project should be sufficient to guide readers in the construction of a PostgreSQL database for the specific use case outlined. The Final Project is graded against a rubric, with criteria assessed on a scale of 0 (not submitted)/ 1 (submitted but deficient)/ 2 (submitted and adequate). In a few occasions, a 3 is awarded to extraordinary products as a bonus. However, students should expect to earn a 2 for a job well done, and that constitutes full credit.

Late Submission Policy for Assignments

Assignments are due on the dates indicated on the course's NYUClasses site. Late submission of problem sets will lead to a two-point reduction for missing the deadline, and another two-point reduction for each day thereafter until submitted.

Overview of the Semester

This is an NYU half course conducted over 7 weeks in 100 minute sessions per week.

□ Week 1: The value of databases and SQL.

- Understand the value of databases

- Explain the differences between relational databases (tabular data storage) and document-based databases (key-value pairs) ○ Understand data schema and learn to query a database using basic SQL syntax

☐ Week 2: Query large databases.
- Use advanced SQL commands to filter data
- Use joins to create relationships between tables to obtain data
- Use SQL Boolean operators and SQL conditional operators to obtain filtered data

☐ Week 3: Data aggregation, efficient, and dynamic queries in SQL.
- Create relationships between tables and data points
- Use SQL conditional operators and Null functions to create Boolean statements ○ Use SQL mathematical functions to clean data
- Use SQL statements to structure data, create new attributes, and combine subqueries into one query

☐ Week 4: Design and create your own database.
○ Outline database structure for the data you want to upload into a database ○ Create and load data into a PostgreSQL database for access by others

☐ Week 5: Information security and access control design. ○ Information security basic concepts
○ Privacy basic concepts and comparison with security ○ Access control, security policies, and models

☐ Week 6: Policies, practices, and procedures for maintaining data integrity and security.
- Data retention, business continuity and disaster recovery policies and practices ○ Good practices in monitoring, oversight, and reporting
- Data privacy, encryption, and personally identifiable information (PII) management

☐ Week 7: Data warehouses, integration, and tools.
○ The rise of big data and associated tools and trends
○ Consideration and approaches to data integration ○ Introduction to Python

Letter Grades

Letter grades for the entire course will be assigned as follows:

Letter Grade	Points
A	4.0 points
A-	3.7 points
B+	3.3 points

B	3.0 points
Letter Grade	**Points**
B-	2.7 points
C+	2.3 points
C	2.0 points
C-	1.7 points
F	0.0 points

Student grades will be assigned according to the following criteria:

- (A) Excellent: Exceptional work for a graduate student. Work at this level is unusually thorough, well-reasoned, creative, methodologically sophisticated, and well written. Work is of exceptional, professional quality.
- (A-) Very good: Very strong work for a graduate student. Work at this level shows signs of creativity, is thorough and well-reasoned, indicates strong understanding of appropriate methodological or analytical approaches, and meets professional standards.
- (B+) Good: Sound work for a graduate student; well-reasoned and thorough, methodologically sound. This is the graduate student grade that indicates the student has fully accomplished the basic objectives of the course.
- (B) Adequate: Competent work for a graduate student even though some weaknesses are evident. Demonstrates competency in the key course objectives but shows some indication that understanding of some important issues is less than complete. Methodological or analytical approaches used are adequate but student has not been thorough or has shown other weaknesses or limitations.
- (B-) Borderline: Weak work for a graduate student; meets the minimal expectations for a graduate student in the course. Understanding of salient issues is somewhat incomplete. Methodological or analytical work performed in the course is minimally adequate. Overall performance, if consistent in graduate courses, would not suffice to sustain graduate status in “good standing.”
- (C/-/+) Deficient: Inadequate work for a graduate student; does not meet the minimal expectations for a graduate student in the course. Work is inadequately developed or flawed by numerous errors and misunderstanding of important issues. Methodological or analytical work performed is weak and fails to demonstrate knowledge or technical competence expected of graduate students.

- (F) Fail: Work fails to meet even minimal expectations for course credit for a graduate student. Performance has been consistently weak in methodology and understanding, with serious limits in many areas. Weaknesses or limits are pervasive.

NYU Classes

All announcements, resources, and assignments will be delivered through the NYU Classes site. I may modify assignments, due dates, and other aspects of the course as we go through the term with advance notice provided as soon as possible through the course website.

Academic Integrity

Academic integrity is a vital component of Wagner and NYU. All students enrolled in this class are required to read and abide by Wagner's Academic Code. All Wagner students have already read and signed the Wagner Academic Oath. Plagiarism of any form will not be tolerated and students in this class are expected to report violations to me. If any student in this class is unsure about what is expected of you and how to abide by the academic code, you should consult with me.

Henry and Lucy Moses Center for Students with Disabilities at NYU

Academic accommodations are available for students with disabilities. Please visit the Moses Center for Students with Disabilities (CSD) website **and click the "Get Started" button. You can also call or email CSD** (212-998-4980 or mosescsd@nyu.edu) for information. Students who are requesting academic accommodations are strongly advised to reach out to the Moses Center as early as possible in the semester for assistance.

NYU's Calendar Policy on Religious Holidays

NYU's Calendar Policy on Religious Holidays states that members of any religious group may, without penalty, absent themselves from classes when required in compliance with their religious obligations. Please notify me in advance of religious holidays that might coincide with exams to schedule mutually acceptable alternatives.

NYU's Wellness Exchange

NYU's Wellness Exchange has extensive student health and mental health resources. A private hotline (212-443-9999) is available 24/7 that connects students with a professional who can help them address day-to-day challenges as well as other health-related concerns.