NYU SCHOOL OF PROFESSIONAL STUDIES

Database Design & Management

MASY1-GC 3500| 200 | Spring 2024 | 01/22/2024 -05/06/2024 | 3 Credit
Modality: Online(Sy)
Course Site URL: https://brightspace.nyu.edu/

General Course Information

Name/Title: Amit Patel, Adjunct Instructor, He/Him/His
NYU Email: asp13@nyu.edu
Class Meeting Schedule: 01/22/2024 -05/06/2024 | Monday | 07:00pm -- 09:35pm
Class Location: Online (Sy)
Office Hours: Zoom Meeting, Tuesday 7:30 PM EST, by requesting an appointment via NYU email. The request should be emailed before Sunday, 7:30 PM EST

Description

This is an introductory course for database management systems and applications. It presents concepts, methodologies, and techniques important for database analysis, design, implementation, and management. The course focuses on the logical, conceptual and physical implementation of relational database management systems so that students can assimilate a basic knowledge of database design as it relates to business rules. The course utilizes a combination of lectures, hands-on computer exercises, examples from Oracle and other leading databases, and real-world database projects to accomplish the learning process.

Prerequisites
MASY1-GC1240 – Information Technology and Data Analytics

Learning Outcomes

At the conclusion of this course, students will be able to:

- Create databases based on the relational database model
- Construct conceptual data logical data models
- Use normalization to providing efficiencies and data integrity
- Transform business requirements into viable, efficient, and reliable databases aligned with business requirements
- Appraise the objectives of data and information management

Communication Methods

Be sure to turn on your NYU Brightspace notifications and frequently check the "Announcements" section of the course site. This will be the primary method I use to communicate information critical to your success in the course. To contact me, send me an email. I will respond within 24 hours.

Structure | Method | Modality

There are 14 session topics in this course. The session topics are organized into three (3) areas of study: 1) Concepts, 2) Learning Principles, and 3) Instructional Design in Practice. Active learning experiences and small group projects are key components of the course.

Assignments, papers, and exams will be based on course materials (e.g., readings, videos), lectures, and class discussions. Course sessions will be conducted synchronously on NYU Zoom, which you can access from the course site in NYU Brightspace.

This course is Online (Sy) and will meet once a week on Mondays, with assignments, announcements and emails being sent through Brightspace. Zoom is the remote instruction platform used at NYU. Students are expected to check email and/or Brightspace at least once a day for announcements concerning assignments, class changes or cancellations, and other important information. The course will involve lecture/discussions/forum discussions as well as case studies.

Expectations

Learning Environment
You play an important role in creating and sustaining an intellectually rigorous and inclusive classroom culture. Respectful engagement, diverse thinking, and our lived experiences are central to this course, and enrich our learning community.

Participation
You are integral to the learning experience in this class. Be prepared to actively contribute to class activities, group discussions, and work outside of class.

Assignments and Deadlines
This is an intensive fourteen-week-long course. Students are expected to complete significant individual readings and complete independent homework assignments during the course. Frequent and high-quality participation in class discussions is required. Readings, individual hands-on exercises, teamwork, and class discussions will be assigned and graded weekly.

Descriptions and due dates can be found in the course outline below. Homework assignments will be posted on the Brightspace website. Their respective due dates will be announced on the Brightspace website and in class. No credit will be given for late homework under any circumstances.

The purpose of the individual project is to cultivate and test your applied database knowledge with a challenging real-world case project utilizing modern RDBMS approaches and techniques that the student will learn throughout the class.

Course Technology Use
We will utilize multiple technologies to achieve the course goals. I expect you to use technology in ways that enhance the learning environment for all students. All class sessions require use of Zoom. All class sessions require use of technology (e.g., laptop, computer lab) for learning purposes.

Feedback and Viewing Grades
I will provide timely meaningful feedback on all your work via our course site in NYU Brightspace. You can access your grades on the course site Gradebook.

Attendance

I expect you to attend all class sessions. Attendance will be taken into consideration when determining your final grade.

Excused absences are granted in cases of documented serious illness, family emergency, religious observance, or civic obligation. In the case of religious observance or civic obligation, this should be reported in advance. Unexcused absences from sessions may have a negative impact on a student's final grade. Students are responsible for assignments given during any absence.

Each unexcused absence or being late may result in a student's grade being lowered by a fraction of a grade. A student who has three unexcused absences may earn a Fail grade.

Refer to the SPS Policies and Procedures page for additional information about attendance.

Textbooks and Course Materials

DATABASE SYSTEMS: DESIGN, IMPLEMENTATION, AND MANAGEMENT, 14th Edition
By Carlos Coronel and Steven Morris
https://www.amazon.com/s/ref=dp_byline_sr_book_2?ie=UTF8&field-author=Steven+Morris&text=Steven+Morris&sort=relevancerank&search-alias=books

ISBN-13: 978-1337627900]
Students can purchase these items through the NYU Bookstore.

Required:

We will be using Oracle Data Modeler, MySQL community server database, and MySQL workbench client for assignments and labs in this course. The below software(s) downloads are free for educational use.

MySQL Community sever (Database): https://dev.mysql.com/downloads/mysql/

MYSQL Workbench (Database client): https://dev.mysql.com/downloads/workbench/

Oracle SQL Developer Data Modeler http://www.oracle.com/technetwork/developer-tools/datamodeler/overview/index.html

Grading | Assessment

Criteria by which student performance will be assessed and percentage (%) of final grade determined by each of the assignments and the homework assignments.

Assignments	Percentage
Class Participation (1% per session)	14%
Individual Homework Assignments	58%
Final Group Project (with presentation)	28%
Total	100%

For the Final Group Project, although you are working in a group, you will be graded individually, based on your individual contribution to the overall group deliverables. Each member is expected to participate in all deliverables, and collaborate with each other, to produce the final deliverables.
Final Group Project Submissions (Group Grade) – 16%
Final Project Report (Group Grade) – 4%
Final Project Presentation (Individual Grade) – 8%

See the "Grades" section of Academic Policies for the complete grading policy, including the letter grade conversion, and the criteria for a grade of incomplete, taking a course on a pass/fail basis, and withdrawing from a course.

Class Structure Overview
We will be working on three different projects in this class that is broken up into four sections each. Each week we will work on one deliverable together in class, then you will work on a similar deliverable as a group. Finally, you will work that similar deliverable individually. This strategy will build a solid foundation in Database Design and Management.

Class Participation (1% for each class session) – 14%
You are required to come prepared for class. This includes reading the required text and lecture slides. Students are required to participate in all classroom activities and discussions (in class and online forums) and may be required to submit work done in class. Grades are assigned daily for class participation.

Individual Homework assignments – 58%

1. Project Scope and Planning - Select something you are passionate about or can relate to, where you can provide a viable database solution
    a. Create a Project Scope document (7 %)
    b. FAME Data Model – Case study (8 %)
2. Logical Data Model - Create a logical Data Model to support your solution
    a. Must be 7 to 10 fully normalized entities (appropriate primary key, foreign keys, data types, proper naming conventions etc.) (7 %)
        i. Create a data dictionary of all elements (entities and attributes)
    b. Post your model to a Brightspace Forum (8 %)
        i. Provide 3 valuable enhancements to 3 different classmates' model
        ii. You are required to implement any/all changes or have an explanation if you disagree
        iii. I will provide detail feedback after all classmates' participation
3. Create Database and load Data - create the physical database
    a. Create the database from the logical Data Model (7 %)
        i. Populate all tables with appropriate data - must have adequate data
    b. HR Schema Queries (3 %)
        i. Questions 1 to 35
    c. Brightspace Forum – SQL Function (4%)
        i. Research and teach the class one "new" function that we did not cover in class. You must describe the function using your data

        ii. Use your data and use another classmate's function
4. Report and Visualization - show reports/charts that illustrates how your solution solves your problem/opportunity, or help with the opportunity
    a. Must include at least 5 different views of the data (7 %)
        i. Must use advance SQL queries (with clauses, pivot functionalities, analytical functions, etc.)
    b. HR Schema Queries (3 %)
        i. Questions 36 to 70
    c. Brightspace Forum – SQL Function (4 %)
        i. Research and teach the class one "new" function that we did not cover in class. You must describe the function using your data
        ii. Use your data and use another classmate's function

Final Group **Project (4 % each for first 4 and 12 % for final deliverable) – 28%**

1. Project Scope and Planning - Select a real business and identify a problem or opportunity, where you can provide a viable database solution
    a. Create a Project Scope document
2. Logical Data Model - Create a logical Data Model to support your solution
    a. Must be at least 10 fully normalized entities (appropriate primary key, foreign keys, data types, proper naming conventions etc.)
    b. Create a data dictionary of all elements (entities and attributes)
3. Create Database and load Data - create the physical database and load it with "real" or "realistic" data
    a. Data must be created in the database from the logical model (after I QA and approve the logical data model)
    b. Populate all tables with appropriate data - must have adequate data to support the problem/opportunity
4. Report and Visualization - show reports/charts that illustrates how your solution solves your problem/opportunity, or help with the opportunity
    a. Must include at least 5 different views of the data
    b. Must use advance SQL queries (pivot functionalities, analytical functions, etc.)
5. Final Presentation - Present your findings to the class. Deliverables include:
    a. All deliverables above
    b. A professional report in word
    c. The final Presentation deck in PowerPoint/Keynote

How to Submit

1. All assignments must be submitted to Brightspace and/or Brightspace forums
2. All assignments are due on the dates designated, and late assignments will not be accepted.

Grading Rubric

1. All assignments must be screenshots of your environment showing your name in the screenshot (e.g.: the connection name in SQL Developer)
2. All deliverables must be a single pdf file and named appropriately as follows (lastname_firstname_assignment.pdf) where "assignment" would be homework4, project5, and so on
3. All individual database objects (tables, views etc.) must be prefixed with your initial (e.g.: Customer table for me would be AP_CUSTOMER)

Although you can use the internet for research/reference purposes, all work must be your own. Any copy/paste from the internet will result in zero for the assignment and/or further disciplinary actions, including an F for the course

Course Outline

Start/End Dates: 01/22/2024 -05/06/2024 | Mondays
Time: 07:00pm - 09:35pm
No Class Date(s): Monday, 2/19/2024 and 03/18/2024
Special Notes: Spring Break 03/18/24 - 03/24/24

Session 1 - 01/22/24
Topic Description:
- *The course overviews*
- *Database Environment and Development Process*
- *Traditional file processing*
- *Database approach*
- *System and Database Development Life Cycle*

Assignments:
- *Read DATABASE SYSTEMS, 13th Ed: Chapter 1,9*

Session 2 – 01/29/24
Topic description –
- *Components of Database Environment*
- *The Database System Environment*
- *DBMS Functions*
- *Managing the Database System: A Shift in Focus*
- *Preparing for Your Database Professional Career*

Assignments:
Setup Oracle and MySQL database design and development environments

Session 3 – 02/05/24
Topic description –
- *Modeling Data in the Organization*
- *Modeling the rules of the organization*
- *Modeling entities and attributes*
- *Modeling relationships*

Assignments:
- *Read DATABASE SYSTEMS, 13th Ed: Chapter 2*
- *Homework 1b – FAME Data model due 02/12/24*

Session 4 – 02/12/24
Topic description –
- *E-R Modeling Example*

- *Big Data Modeling*
- *Data Enhanced E-R Model*
- *Representing supertypes and subtypes*
- *Specifying Constraints in Supertype/Subtype Relationships*

Assignments:

- *Read DATABASE SYSTEMS, 13th Ed: Chapter 3,4*
- *Group Project 1 – Project Scope due 02/26/24*

Session 5 – 02/26/24

Topic description –

- *Logical Database Design and the Relational Model*
- *The relational data model*
- *Integrity constraints*
- *Transforming EER Diagrams into Relations*
- *Introduction to normalization*
- *Merging relations*

Assignments:

- *Read DATABASE SYSTEMS, 13th Ed: Chapter 5*
- *Homework 1a – Project Scope due 10/10/23*

Session 6 – 03/04/24

Topic description –

- *Database Tables and Normalization*
- *The Need for Normalization*
- *The Normalization Process*
- *Surrogate Key Considerations*
- *Higher-Level Normal Forms*
- *Normalization and Database Design*
- *Denormalization*
- *Data-Modeling Checklist*

Assignments:

- *Read DATABASE SYSTEMS, 13th Ed: Chapter 6*
- *Group Project 2 – Logical Data Model due 03/11/24*

Session 7 – 03/11/24

Topic description –

- *Introduction to SQL*
- *Origins of the SQL standard*
- *The SQL environment*
- *Defining a database in SQL*
- *Inserting, Updating, and Deleting Data*
- *Internal schema definition in RDBMS*

Assignments:

Read DATABASE SYSTEMS, 13th Ed: Chapter 7

Session 8 – 03/25/24
Topic description –

- *Processing single tables*
- *Processing multiple tables*
- *Tips for developing queries*
- *Virtual Tables (Views)*
- *Advanced SQL*

Assignments:

- *Read DATABASE SYSTEMS, 13th Ed: Chapter 8*
- *Homework 2 – Logical Data Model due 04/01/24*

Session 9 – 04/01/24
Topic description –

- *Need for Data Analysis*
- *Business Intelligence*
- *SQL Analytic Functions*
- *Data Visualization*
- *Data Warehouse*

Assignments:

- *Read DATABASE SYSTEMS, 13th Ed: Chapter 13*
- *Group Project 3 – Physical Database due 11/06/23*

Session 10 – 04/08/24
Topic description –

- *Data as a Corporate Asset*
- *The Need for a Database and Its Role in an Organization*
- *The Evolution of Database Administration*
- *The Database Environment's Human Component*
- *Database Security*
- *Database Administration Tools*

Assignments:

- *Read DATABASE SYSTEMS, 13th Ed: Chapter 16*
- *Homework 3 (Physical Database, HR Queries, SQL Functions) due 04/15/24*

Session 11 – 04/15/24

- *Topic description –*
- *Database Performance-Tuning Concepts*
- *Query Processing*
- *Indexes and Query Optimization*
- *SQL Performance Tuning*
- *DBMS Performance Tuning*

Assignments*:*

- *Read DATABASE SYSTEMS, 13th Ed: Chapter 11*
- *Group Project 4 – Reports using SQL due 04/22/24*

Session 12 – 04/22/24
Topic description –

- *The Evolution of Distributed Database Management Systems*
- *DDBMS Advantages and Disadvantages*
- *Distributed Processing and Distributed Databases*
- *Characteristics of Distributed Database Management Systems*

Assignments:

- *Read DATABASE SYSTEMS, 13th Ed: Chapter 12*
- *Homework 4 (Reports using SQL, HR Queries, SQL Functions) due 04/29/24*

Session 13 – 04/29/24
Topic description –

- *Data visualization*
- *Big Data Analysis*
- *Big Data and Analytics, NoSQL, Hadoop, Analytics*
- *Impact of Data Analytics*

Assignments:

- *Read DATABASE SYSTEMS, 13th Ed: Chapter 14*
- *Group Project 5 – Final Presentation due 05/06/24*

Session 14 – 05/06/24
Topic description –

- *Procedural SQL (PL/SQL)*
- *Database Triggers, Procedures, Functions*
- *Final Project Presentation*
- *Course Conclusion*

NOTES:
The syllabus may be modified to better meet the needs of students and to achieve the learning outcomes.

The School of Professional Studies (SPS) and its faculty celebrate and are committed to inclusion, diversity, belonging, equity, and accessibility (IDBEA), and seek to embody the IDBEA values. The School of Professional Studies (SPS), its faculty, staff, and students are committed to creating a mutually respectful and safe environment (*from the SPS IDBEA Committee*).

NYU SCHOOL OF PROFESSIONAL STUDIES

New York University School of Professional Studies Policies

1. Policies - You are responsible for reading, understanding, and complying with University Policies and Guidelines, NYU SPS Policies and Procedures, and Student Affairs and Reporting.

2. Learning/Academic Accommodations - New York University is committed to providing equal educational opportunity and participation for students who disclose their dis/ability to the Moses Center for Student Accessibility. If you are interested in applying for academic accommodations, contact the Moses Center as early as possible in the semester. If you already receive accommodations through the Moses Center, request your accommodation letters through the Moses Center Portal as soon as possible (mosescsa@nyu.edu | 212-998-4980).

3. Health and Wellness - To access the University's extensive health and mental health resources, contact the NYU Wellness Exchange. You can call its private hotline (212-443-9999), available 24 hours a day, seven days a week, to reach out to a professional who can help to address day-to-day challenges as well as other health-related concerns.

4. Student Support Resources - There are a range of resources at SPS and NYU to support your learning and professional growth. For a complete list of resources and services available to SPS students, visit the NYU SPS Office of Student Affairs site.

5. Religious Observance - As a nonsectarian, inclusive institution, NYU policy permits members of any religious group to absent themselves from classes without penalty when required for compliance with their religious obligations. Refer to the University Calendar Policy on Religious Holidays for the complete policy.

6. Academic Integrity and Plagiarism - You are expected to be honest and ethical in all academic work. Moreover, you are expected to demonstrate how what you have learned incorporates an understanding of the research and expertise of scholars and other appropriate experts; and thus recognizing others' published work or teachings—whether that of authors, lecturers, or one's peers—is a required practice in all academic projects.

Plagiarism involves borrowing or using information from other sources without proper and full credit. You are subject to disciplinary actions for the following offenses which include but are not limited to cheating, plagiarism, forgery or unauthorized use of documents, and false form of identification

Turnitin, an originality detection service in NYU Brightspace, may be used in this course to check your work for plagiarism.

Read more about academic integrity policies at the NYU School of Professional Studies on the Academic Policies for NYU SPS Students page.

7. Use of Third-Party Tools - During this class, you may be required to use non-NYU apps/platforms/software as a part of course studies, and thus, will be required to agree to the “Terms of Use” (TOU) associated with such apps/platforms/software.

These services may require you to create an account but you can use a pseudonym (which may not identify you to the public community, but which may still identify you by IP address to the company and companies with whom it shares data).

You should carefully read those terms of use regarding the impact on your privacy rights and intellectual property rights. If you have any questions regarding those terms of use or the impact on the class, you are encouraged to ask the instructor prior to the add/drop deadline.