

Database Design & Management

MASY1-GC 3500 | 105 | Spring 2024 | 01/24/2024 -05/01/2024 | 3 Credit

Modality: In-person

Course Site URL: <https://brightspace.nyu.edu/d2l/home/285740>

General Course Information

Name/Title: Toby Penk, Adjunct Instructor

NYU Email: tp1488@nyu.edu

Class Meeting Schedule: 01/24/2024 -05/01/2024 | Wednesdays | 06:20pm -- 08:55pm

Class Location: Bldg: MIDC Room 506

Office Hours: Contact me via email to make appointment.

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) Data Modeling, 2) Basic SQL, and 3) Advanced SQL.

In this course, you will learn to design data storage systems, write queries that extract data

from them, and maintain and upgrade them over time. You will leave this course with a strong grasp of data storage concepts and the underlying theory that makes them work.

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 Blended - In-person and will meet once a week on Wednesday, 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 twice a week for announcements concerning assignments, class changes or cancellations, and other important information. The course will involve lecture/discussions/forum discussions as well as hands on practical real life projects. Two major papers/projects are required that will both be done on an individual basis.

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

We will have homework or group assignments assigned every week and will be due the following week. All assignments must be submitted to the appropriate Brightspace assignment.

View Course outline [here](#).

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.

Refer to the [SPS Policies and Procedures](#) page for additional information about attendance.

Textbooks and Course Materials

Students can purchase these items through the NYU Bookstore.

Required: Database Systems: Design, Implementation, & Management 14th Edition (January 1, 2022) ISBN-13: 978-0357673034

Required Software/Environment

We will be using Oracle database for assignments and labs in this course. The below software(s) downloads are free for educational use. You will need to create an account with Oracle. We will connect to NYU Oracle environment, which we will go over in class, step-by-step

Software used in this class (on your personal laptop)

1. Oracle SQL Developer - <http://www.oracle.com/technetwork/developer-tools/sql-developer/overview/index.html>
2. Oracle SQL Developer Data Modeler <http://www.oracle.com/technetwork/developer-tools/datamodeler/overview/index.html>
3. ASCII text editor - [Visual Studio Code](#)
4. Windows only: putty and pscp - Putty <https://www.putty.org/>

Grading | Assessment

All assignments must be submitted through the appropriate channels (assignments, discussion topics etc.) in Brightspace.

Your grade in this course is based on your performance on multiple activities and assignments. Since all graded assignments are related directly to course objectives and learning outcomes, failure to complete any assignment will result in an unsatisfactory course grade. All written assignments are to be completed using APA format and must be typed and double-spaced. Grammar, punctuation, and spelling will be considered in grading. Please carefully proof-read your written assignments before submitting them for a grade. I will update the grades on the course site each time a grading session has been completed— typically within one week following the completion of an activity.

Participation: 14% of your grade.

1. Come prepared to class, having read the text and any slides / other materials
2. Participate in online discussions and feedback for other students

Individual homework assignments: 56% of your grade. Details and expected formats will be provided during class sessions.

1. Week 2: Intro to data storage
 - a. Create a crude data table in excel, with multiple types of data in single rows
 - b. Discuss the limitations of this data storage model for data integrity and analysis
2. Week 4: Improving data storage models

- a. Adapt your data model from assignment 1 to leverage multiple, separate tables
 - b. Discuss the advantages of this approach over your first implementation
3. Week 6: Implementing logical models
 - a. Create a logical model of your database design from assignments 1 and 2
 - b. Use Oracle to translate this logical model into a relational model
 - c. Manually populate your database with a reasonable amount of relevant data
4. Week 8: Manipulating data in an existing database
 - a. Write SQL queries to create, update, and delete both data and tables
 - b. Write SQL queries to update internal and foreign constraints on tables
5. Week 10: Analytical SQL queries
 - a. Write SQL queries to generate useful analytical reports on your data
6. Week 12: Advanced SQL
 - a. Create and query a view
 - b. Establish and use SQL functions
 - c. Create a Powerpoint presentation of your data outputs

Group projects: 30% of your grade. Details will be provided during class sessions.

1. Week 1
 - a. Choose your groups and establish email threads, shared document storage
2. Week 3
 - a. Establish group project scope
3. Week 5
 - a. Create, implement, and populate data model
4. Week 7
 - a. Develop basic SQL reports
5. Week 9
 - a. Develop advanced SQL reports
6. Week 13
 - a. Finalize group presentations
7. Week 14
 - a. Deliver final presentations

<u>DESCRIPTION</u>	<u>PERCENTAGE</u>
Class Participation (1% per session)	14%
Individual Homework Assignments (10% per)	60%
Final Group Project and presentation	26%
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Total	100%

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.

Course Outline

Start/End Dates: 01/24/2024 -05/01/2024 / Wednesdays

Time: 06:20pm -- 08:55pm

No Class Date(s): Wednesday - 03/20/2024

Special Notes: Spring Break 03/18/24 - 03/24/24

Session 1 – 01/24/24**Topic Description:**

- Course overview
- Methods of data storage and processing
- Database development lifecycle
- Basic data storage

Assignments:

- Read chapters 1 & 9
- Choose a group for final project

Session 2 – 01/31/24**Topic description –**

- Components of a database environment
- What a database management system (DBMS) does
- Managing a database system over time
- Preparing for a career in database systems

Assignments:

- Install Oracle software
- Assignment 1

Session 3 – 02/07/24**Topic description –**

- The process of database modeling in a business
- Modeling business rules
- Translating business rules into database objects
- Establishing relationships in the database model

Assignments:

- Read chapter 2
- Group project: establish project scope

Session 4 – 02/14/24**Topic description –**

- Entity-relationship (ER) modeling
- Big data modeling
- The enhanced ER (EER) model
- Types of tables and concept inheritance
- Inheritance constraints

Assignments:

- Read chapters 3 & 4
- Assignment 2

Session 5 – 02/21/24**Topic description –**

- Relational modeling
- Data integrity constraints
- Translation of logical to relational models
- Normalizing relational models
- Merging data across tables

Assignments:

- Group project: create, implement, and populate data model

Session 6 – 02/28/24**Topic description –**

- Normalization concepts
- Establishing keys
- Violating normalization
- Checklist of data modeling

Assignments:

- Read chapter 6
- Assignment 3

Session 7 – 03/06/24**Topic description –**

- SQL concepts

Assignments:

- Read chapter 7
- Group project: Develop reports using SQL queries

Session 8 – 03/13/24**Topic description –**

- Querying single tables
- Querying multiple tables
- Query development best practices
- Creating views
- Advanced SQL concepts

Assignments:

- Read chapter 8
- Assignment 4

2024-03-20 – No Class (Spring break)**Session 9 – 03/27/24****Topic description –**

- From SQL to business analysis
- SQL analytic functions
- Data visualization
- Enterprise data warehouse concepts

Assignments:

- Read chapter 13
- Group project: develop reports with advanced SQL concepts

Session 10 – 04/03/24**Topic description –**

- Enterprise data uses
- Enterprise database administration
- Real-world considerations of the enterprise data environment
- Securing enterprise data
- Database administration tools

Assignments:

- Read chapter 16
- Assignment 5

Session 11 – 04/10/24**Topic description –**

- Tuning queries
- Indexing
- Tuning database design

Assignments:

- None

Session 12 – 04/17/24**Topic description –**

- Distributed database systems

Assignments:

- Read chapter 12
- Assignment 6

Session 13 – 04/24/24**Topic description –**

- Data visualization
- Analysis and reporting in a big data environment
- NoSQL

Assignments:

- Read chapter 14
- Finalize group presentation

Session 14 – 05/01/24**Topic description –**

- Intro to PL/SQL
 - Final presentations
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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](#)*).

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.