**Advanced Database Applications**

**MASY1-GC 3525 | 102 | Fall 2024 | 09/09/2024 – 12/09/2024 | 3 Credits**

**Modality:** In-Person

**Course Site URL:** <https://brightspace.nyu.edu/>

**General Course Information**

**Name/Title:** Bohdan Hawryluk, Adjunct Instructor

**NYU Email:** bh54@nyu.edu

**Class Meeting Schedule:** 09/09/2024 – 12/09/2024 | Mondays | 02:00pm - 04:35pm

**Class Location:** 7 East 12th St, Room 332

**Office Hours:** Office hours by appointment only. Please request an appointment by email. All appointments will be on Zoom. The Zoom link will be emailed to you before the appointment.

**Description**

This course focuses on database language to prepare application developers and system integrators with knowledge of basic relational concepts. The course covers the important features of advanced RDBMS with Internet-oriented, object-relational database features, including T-SQL (Transact-SQL) Structured Query Language (SQL) program tracing and tuning. Students design, develop, and implement advanced relational databases and use those databases for transaction processing, report generation, and queries. The main goal of the course is to teach students how to use modern databases to gain a competitive advantage for corporations.

**Prerequisites**

3500 – DATABASE DESIGN & MANAGEMENT

**Learning Outcomes**

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

* Design database structures using Entity Relation Diagram (ERD)
* Use Structured Query Language (SQL) to program database applications
* Use Extract Transform Load (ETL) for loading data from one source to another
* Select the appropriate Extract Transform Load (ETL) tools to transfer data from one source to another
* Create web-based database applications using Microsoft SQL Server and Structured Query Language (SQL)
* Integrate business logic into database applications
* Acquire knowledge to provide corporations with a competitive advantage

**Communication Methods**

Be sure to turn on your [NYU Brightspace notifications](about:blank) 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 48 hours.

Credit students must use their NYU email to communicate. Non-degree students do not have NYU email addresses. Brightspace course mail supports student privacy and FERPA guidelines. The instructor will use the NYU email address to communicate with students. All email inquiries will be answered within 48 hours.

**Structure | Method | Modality**

There are fourteen session topics in this course. The session topics are organized into two areas of study: 1) Logical Principles that define the logic and infrastructure of Relational Databases, and 2) Physical or actual coding of the databases.

Active learning experiences, labs, assignments, and project is a key component of the course. Labs, assignments, project, exams, lectures, and class discussions will be based on course materials (e.g., readings). Course sessions will be conducted in person.

This course is in-person 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 twice a week for announcements concerning assignments, class changes or cancellations, and other important information. The course will involve lectures/discussions/forum discussions and case studies. Each student will complete the project using Microsoft SQL Server, and SQL Server Management Studio is required. Both of these applications will be covered during the class.

**Expectations**

Learning Environment

You are essential in creating and sustaining an intellectually rigorous and inclusive classroom culture. Respectful engagement, diverse thinking, and 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

Assignment 1: Entity Relationship Diagram (ERD) is due by Midterm. This is not a graded assignment. Failure to submit ERD for Review by midterm will lower your final project grade. For the due date, please see the appropriate milestones in Course Outline section.

Assignment 2: Your final project version is due on December 02, 2024, at Midnight. For actual requirements of what is due, please refer to the project section described in this document. Extensions will be allowed only in special circumstances and after clear communication on reasons for extension.

Course Technology Use

This class teaches multiple technologies to help students achieve their course goals. Students are expected to use these technologies in ways that enhance the learning environment. All class sessions require Zoom and technology (e.g., laptop, computer lab) for learning purposes.

**Generative AI Use**

Students can only learn from the work you do. Unless otherwise stated, students should not use generative AI tools to create any part of an assignment in this course; the student should complete every submission (for example, from an NYU course).

You are strictly prohibited from using third-party tools to generate any code for your project. Doing so is considered plagiarism and will result in an F grade for the project or the course. You cannot use generative applications to create ERD or SQL code. During the class, you will learn the expected industry coding standards. Third-party tools produce generic code that doesn't follow these standards and will be treated as plagiarism. The grade penalty will depend on the amount of generated code used, with severe violations resulting in an F for the course.

This course assumes that work submitted by students – all process work, drafts, brainstorming artifacts, and final works – will be generated by the students themselves, working individually or in groups as directed by class assignment instructions. As will any other class work generated by anyone other than the students (by other students, by a company, or by using generative AI tools), use can be a violation of Academic Integrity policy (adapted example from [University of Texas, Austin](https://ctl.utexas.edu/chatgpt-and-generative-ai-tools-sample-syllabus-policy-statements)).

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.

Students are encouraged to seek feedback on their projects throughout the course to avoid common mistakes and achieve better grades. Since this course is based on case studies, creating a database for competitive advantage and continuous feedback is crucial for your project's success and your overall learning outcomes. Request feedback as soon as you start working on your project to improve your learning, midterm, and final grades.

Attendance

It is expected that students will attend all class sessions. Attendance will be taken into consideration when determining your final grade. Refer to the [SPS Policies and Procedures page](about:blank) for additional information about attendance.

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.

Students who join the course during add/drop are responsible for ensuring that they identify what assignments and preparatory work they have missed and complete and submit those per the syllabus.

**Textbooks and Course Materials**

*The primary text for this course is:*

[1] You can pick one of the following books (you do not need both of them). You can use any version of this book starting from what is listed up until latest release.

Adam Jorgensen. 2014. Professional Microsoft SQL Server 2014 Administration. First Edition. Wrox. ISBN 978-1118859131

This book can also be located in many online book retailers. You can use the links below to locate some of them. The average price is $35.00.

http://www.amazon.com/Professional-Microsoft-Server-2014-Administration/dp/1118859138/ref=sr\_1\_1?s=books&ie=UTF8&qid=1422378015&sr=1-1&keywords=professional+microsoft+sql+server+2014+administration

You also can use the following book and later releases of this bood:

[2] Adam Jorgensen. 2012. Professional Microsoft SQL Server 2012 Administration. First Edition. Wrox. ISBN 978-1-118-10688-4

This book can also be located in many online book retailers. You can use the links below to locate some of them. The average price is $33.00.

<http://www.amazon.com/Professional-Microsoft-Server-2012-Administration/dp/1118106881>

Alternatively, any book on Microsoft SQL Server is acceptable. You can pick earlier or later versions of these books. If there is a need for any additional materials, please request a meeting to discuss these extra materials. In general, all required information will be discussed during the class.

**Grading | Assessment**

Student grade for 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 or timely submit any assignment will result in an unsatisfactory course grade. All coding assignments should be indented, and visual images should be eligible without the need to zoom in/expand the image. Please carefully review any submitted assignments before uploading them for grading. Late assignment submissions will be penalized. One day late will result in -10%. Two days late will result in -20%. Three days late -30%. Four days late -40%. Five days late -50%. Six days late -60%. Seven days late -100%. Any changes to this policy will be further discussed during the class. This policy will be changed only in specific situations and will be determined on a case-by-case basis.

**Class Project**

Each student must submit a class project, which involves creating a database and appropriate sample data. Project requirements are as follows:

* Two complex INSERT statements that insert data into your application.
* Three advanced SQL queries that retrieve data from your database.
* 40+ Tables (Scripted).
* Database will be in 3NF (will be explained in the class).
* All Queries must be in Stored Procedures or appropriately scripted (this will be shown in class).
* Statements cannot generate errors or duplications of data.

The project must solve specific business needs, and all queries must solve specific business problems, such as the corporation's regular day-to-day operations. This database can represent a fake or real corporation. Examples: bakery, softball team, financial institution, flower shop, your own small corporation. The main idea is to solve the actual problem in the world.

The following issues will lead to a loss of points and will cause a major penalty in grade:

* Query is one line long or extremely simple. It is expected to create reasonably complex queries. This will be discussed during the class.
* Submitted solutions did not use joins for three advanced SQL queries.
* Solution used less than three tables in queries (more on this in class). This is a severe penalty.
* Solution inserted only a single row in your insert statement (INSERT queries). Students are expected to create insert statements for all your tables. The database is expected to contain 3 -10 rows in each table as a minimum.
* Tables are not in 3NF (Grade penalty will depend on the severity of the problem). Please refer to the section on feedback. It is imperative to seek feedback on this project section to avoid grade penalties. History shows that students who seek advice on projects get better results, learn more, and get better grades.
* Queries produce errors or duplications. This will be explained during the class.
* Poorly formatted code will not be graded, will receive a 0 grade, and will be returned to the student. Once the code is fixed, the student will receive a 10% penalty on the grade. This will be explained in class.
* If third-party applications formatted or created the code, it will receive 0 for your project. Third-party applications are considered plagiarism, will receive an F grade, and will be reported appropriately. This will be discussed during the class.
* It is expected that, in the project, we will use most, if not all, of the material presented during class. A good grade depends on the number and complexity of concepts used in the project.
* Queries cannot fail. Failed queries will receive a score of 0. This will be discussed in class.
* Database tables cannot fail. If they fail, they will receive a score of 0 during grading. This will be discussed in class.

Each student must write their code. Third-party applications are prohibited and will result in a score of 0 for the project. ERD or code generation tools are strictly forbidden, considered plagiarism, and will be penalized according to plagiarism rules.

This class is based on actual code, so students are expected to deliver high-quality queries.

Students are expected to start working on the project at the beginning of the class.

Students are expected to submit their project ideas by the end of the third class. Seeking feedback is very important. Please request a meeting to discuss your project idea. Regular feedback for the project will increase the chances of a good grade.

This is how the project will be graded:

Database – will be judged for complexity and 3NF.

Queries – will be judged for complexity: do they work; do they fail; are they complex; simple queries will receive a score of 0 (this will be explained during the class).

Inserts – do they work, do they have errors, or are they complex?

NOTE: All details about project expectations will be discussed in class. Coding samples for A grade will be created during the class and will be uploaded for your review.

WARNING: Start working on your project from day 1. Do not expect to complete this project in the last week of the class. This is the complex project that represents 30% of your grade. Ask for feedback frequently. Asking for feedback will increase your chances of good grades.

**DESCRIPTION** **PERCENTAGE**

Midterm 30%

Final 30%

Project 30%

Class Participation 10%

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TOTAL POSSIBLE 100%

See the [“Grades” section of Academic Policies](about:blank#Graduate1)” 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.

**NYU SPS Graduate Grading Scale**

|  |  |  |  |
| --- | --- | --- | --- |
| **A** | 95-100 | 4.000 | **Exceptional:** Demonstrates exceptional mastery of all learning outcomes of the course and thorough and complete understanding of all concepts. |
| **A-** | 90-94 | 3.667 | **Excellent:** Demonstrates highly competent mastery of all learning outcomes of the course and strong understanding of all concepts. |
| **B+** | 87-89 | 3.333 | **Very Good; exceeds course standards:** Demonstrates mastery of all learning outcomes of the course and understanding of core concepts. |
| **B** | 83-86 | 3.000 | **Good; meets course standards:** Demonstrates mastery of some learning outcomes; understanding of some core concepts could be improved. |
| **B-** | 80-82 | 2.667 | **Somewhat Satisfactory;** meets some course standards and requires improvement: Demonstrates basic understanding of some learning outcomes; improved understanding of all core concepts is needed. |
| **C+** | 77-79 | 2.333 | **Less than Satisfactory; requires significant improvement:** Demonstrates partial understanding of all learning outcomes and core concepts; requires significant improvement. |
| **C** | 73-76 | 2.000 | **Unsatisfactory; requires substantial improvement:** Demonstrates partial understanding of some learning outcomes and core concepts; requires substantial improvement. |
| **C-** | 70-72 | 1.667 | **Unsatisfactory; requires extensive improvement:** Demonstrates poor understanding of all learning outcomes and core concepts; requires extensive improvement. |
| **F** | Below 70 |  | **Fail:** Demonstrates minimal to no understanding of all key learning outcomes and core concepts; work is unworthy of course credit towards the degree. |
| **P** |  |  | **Passing:** If a Pass/Fail grade is allowed, the choice of pass/fail must be made prior to the completion of the fifth week of the term. |

**Course Outline**

**Start/End Dates:** 09/09/2024 – 12/09/2024 / Mondays

**Time:** 02:00pm - 04:35pm

**No Class Date(s):** Monday - 10/14/2024

**Special Notes:** Tuesday 10/15/2024 – Legislative Monday: Classes will meet according to a Monday schedule on Tuesday, October 15, 2024.

This is a tentative course outline. The first class will contain a short exercise (short exam). You cannot study or prepare for it. It is not graded. It will serve as the overall class level and preparedness for the material presented. Do not worry about passing or failing it. It will show an average skillset for the class and guide material selection for the class duration. Based on this short exercise, the following list may be revised.

**Section 1:** 09/09/2024

* Short Exercise
* Introduction
* Course Outline
* Discussion of the class Project as a one semester-long assignment
* Discussion of the rules and structure of the class
* Introduce the concept of ACID.

**Section 2:** 09/16/2024

* Continue the discussion on basic concepts, components, and administration
  + Master database
  + Temp database
  + Other databases
  + Data types
  + Introduce the concepts with respect to server configuration
  + SA or System Administrator account
  + TCP-IP configuration
  + Other concepts.

**Section 3:** 09/23/2024

* 3NF database normalization.
* This class will also cover the installation and configuration of the Microsoft SQL Server.
* **Assignment**: Ask for feedback on your project.

**Section 4:** 09/30/2024

* In a class exercise in 3NF – this will be a full one-class-long exercise where all students will be divided into teams and will design a database. Do not skip this class. Your project 3NF grade depends on your participation and understanding of these concepts.
* **Assignment**: Send me an email with your project idea and your first try on ERD.

**Section 5:** 10/07/2024

* Installation and Configuration of SQL server.
* Discussion on how to set up the environment and how to use it.
* Backing up and restoring the server.
* Server Maintenance.

**Section 6:** 10/14/2024

* Querying the database.
* Data Definition Language.
* Table scripting for the project and continuous deployment.
* Table scripts that do not fail.
* System tables that cover tables, columns, and much more.
* **Assignment: Send me an email with your ERD**

**Section 7:** 10/21/2024

* **Midterm Exam**

**Section 8:** 10/28/2024

* Data Definition Language
* Table scripting for the project and continuous deployment
* Table scripts that do not fail
* System tables that cover tables, columns, and much more
* Basic stored procedures,
* Final thoughts on Data Definition Language
* Data Manipulation Language,
* Introduction to variables and how they are used in stored procedures
* SQL queries

**Section 9:** 11/04/2024

* Advanced stored procedures
* Data retrieval and manipulation through the use of SQL scripts
* Data Manipulation Language
* Complex Queries
* Temporary tables

**Assignment:** This is an optional assignment. Send me an email with feedback on student projects.

**Section 10:** 11/11/2024

* Data Manipulation Language
* Stored Procedures
* Copy and retrieval of data
* Basic automation of processes
* Data manipulation

**Assignment:** This is an optional assignment. Send me an email with feedback on student projects.

**Section 11:** 11/18/2024

* Bulk import,
* Normalization of data from bulk import
* Extract Load Transform (ETL) process works
* Data Import Automation

**Assignment:** This is an optional assignment. Send me an email with feedback on student projects.

**Section 12:** 11/25/2024

* Project preparedness
* Complexity of SQL
* **This class will be more open-ended discussion either on project issues, issues with code, student code questions, or student project questions**
* If time permits: Error Handling
* If time permits: Advanced data manipulation
* If time permits: Usage of SQL for advanced queries, data retrieval, data manipulation
* If time permits: Use any topics that were moved or altered during the class

**Section 13:** 12/02/2024

* **Project Presentation**

**Section 14:** 12/09/2024

* **Final Exam**

Above is a tentative outline for the course. Many more concepts will be described during the class.

**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*](about:blank)).

**New York University School of Professional Studies Policies**

1. Policies - You are responsible for reading, understanding, and complying with [University Policies and Guidelines](about:blank), [NYU SPS Policies and Procedures](about:blank), and [Student Affairs and Reporting](about:blank).

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](about:blank). If you are interested in applying for academic accommodations, contact the [Moses Center](about:blank) as early as possible in the semester. If you have already received accommodations through the Moses Center, request your accommodation letters through the [Moses Center Portal](about:blank) as soon as possible ([mosescsa@nyu.edu](about:blank) | 212-998-4980).

3. Health and Wellness - To access the University's extensive health and mental health resources, contact the [NYU Wellness Exchange](about:blank). 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](about:blank).

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](about:blank) 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](about:blank), 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](about:blank) page.

For the purpose of this course, any usage of third-party tools to generate any sections of the code, normalization, or usage of any application to create a project will be considered a failure and will be equalized to failing a Turnitin submission and will result in an F grade for the project or an F grade for the course. Any submission of the code that does not correspond with the grade gained during the exam will be assumed usage of third-party tools or help from more advanced SQL code users and will result in a grade penalty. Any suspension of third-party tool usage will receive a grade penalty. Coding standards will be discussed during every class and will have a severe influence on the grade. Any deviations from coding standards discussed during the class will be deemed as cheating and third-party software usage.

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.

**Disruptive Behavior**

Behavior that is deemed by the instructor as disruptive will be penalized through a 5% reduction of your final grade for each instance without warning. Examples of disruptive behavior include 1) the use of language beyond the acceptable bounds of civility and decency, 2) the use of personal electronic devices, 3) excessive talking, 4) sleeping, and 5) watching videos on lab terminals, 6) inappropriate behavior toward other students or teacher. Your adviser will also be informed of each instance of disruptive behavior.