**SQL Programming Language**

INFO1-CE9272.001 | Spring 2024 | Mondays 1/29 – 4/1/2024

Online Synchronous via Zoom Sessions

Course Site URL: <https://brightspace.nyu.edu/d2l/home/297916>

**General Course Information**

Faculty Name & Title: Sam Sultan, Adjunct Assistant Professor

NYU email: [sam.sultan@nyu.edu](mailto:sam.sultan@nyu.edu)

Class Meeting Schedule: Mondays – 1/29/2024 – 4/1/2024 @ 6:30pm-9:30pm

Class Location: Online Synchronous through Zoom.

Office Hours: Email instructor to request an appointment.

**Description**

Structured Query Language (SQL) is the language used to manipulate data in relational databases. Learn to use SQL to select, update, insert, and delete data from database tables, and acquire hands-on experience with both Oracle and MySQL. Learn how to select data from multiple tables using both inner and outer joins and unions, understand how to create subqueries to develop more complex retrieval capabilities, and use DDL to create your own database and to populate tables. In addition, learn about database design, primary keys, foreign keys, indexes, table relationships, referential integrity, and normalization/denormalization techniques. This course prepares you to work with any relational database, such as Oracle, MySQL, PostgreSQL SQL Server, SQLite, and others.

**Prerequisites**

None. No previous programming knowledge is required.

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**Learning Outcomes**

* Knowledge of SQL code based on ANSI/ISO standards utilizing MySQL or Oracle database servers
* The ability to query database content with sophisticated SELECT commands
* The ability to update database content with SQL instructions
* The skills necessary to retrieve data with filter conditions and from multiple tables using various types of join commands

**Communication Methods**

Be sure to turn on your [NYU Brightspace notifications](https://www.nyu.edu/servicelink/KB0018507) 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 24-48 hours.

**Structure | Method | Modality**

There are 10 session topics in this course. The session topics are both lectures, live demonstrations, and hands-on practice. There will be exercises/assignments throughout the course. There will also be a final exam that will test student acquisition and learning of course materials. Course sessions will be conducted synchronously on NYU Zoom, which can be accessed from the course site in [NYU Brightspace](https://brightspace.nyu.edu/).

**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 live experiences are central to this course, and enrich our learning process.

Participation

You are integral to the learning experience in this class. Be prepared to actively contribute to class activities, discussions, and work outside of class. Each student is expected to ask at least one question or respond to instructor or other student question or inquiry at least once every session.

Assignments and Deadlines

Exercises/assignments should be completed before due date. Due dates in most cases are one week from assigned date,, and are due prior to meeting the following week. Assignment and questions relating to assignments are covered and discussed during the first few minutes of the following week’s session.

Course Technology Use

You will need a computer to access the course session via NYU Zoom. Course content is provided online over the internet through various web pages and Microsoft Word documents. Access to both Oracle and MySQL databases are also provided over the internet.

Feedback and Viewing Grades

I will provide grades and feedback on your work/exam via our course site in NYU Brightspace within 1 week of submission. 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](https://www.sps.nyu.edu/homepage/student-experience/policies-and-procedures.html) for additional information about attendance.

**Textbooks And Course Materials**

**Required Books**

* Teach Yourself SQL in 24 Hours (7th Edition) 2021
  + **Authors** - Ryan Stephens
  + **Publisher** – SAMS
  + **ISBN** – 0137543123 **ISBN-13 -** 978-0137543120

**Grading | Assessment**

Your grade in this course is based on your performance on exercise assignments, and a final exam. Keeping up with the course content, materials and practice is of utmost importance and it is directly related to course objectives and learning outcomes Failure to do so will result in attaining an unsatisfactory course grade.

Course grading and assessment is based on:

DESCRIPTION PERCENTAGE

Attendance and class participation 10%

Homework assignments 10%

Final Exam 80%

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TOTAL POINTS 100%

*You can choose to take the course using a Pass/Fail option. You can also choose to take it on a Non-Evaluative basis. In either case, if you are taking multiple NYU courses leading toward a Certificate, the Pass/Fail or the Non-Evaluative option will not be credited toward attaining that certificate. If you choose to take the course using a P/For NE option, you must submit a P/F or NE form before final exam.*

**Course Outline**

**Week 1, Session 1, Introduction to Databases**

* Introduction to databases
* What is a database?
* The History of databases
* The various database models
* Hierarchical databases
* Network databases
* Relational databases
* Object & Object relational databases
* NoSQL and Big Data databases

**Reading:** Chapter 1

**Assignment:** Further reading on the web regarding different database models

**Week 2, Session 2, Introduction to the SQL Language**

* Introduction to SQL
* Flavors of SQL
* DDL - Data Definition Language
* DML - Data Manipulation Language
* The SELECT statement
* Choosing distinct values
* The WHERE clause
* Comparison operators
* Comparing with LIKE
* Logical operators, AND, OR, NOT
* Numeric operators
* Creating computational columns

**Reading:** Chapter 2, 3

**Exercise/Assignment:** See online course session

**Week 3, Session 3, Selecting Data from Multiple Tables**

* Selecting data from multiple tables
* The join construct.
* Old vs. new join syntax
* Normal or Inner join
* Cross join - Cartesian product
* Outer join vs. Inner join
* What is a Self-Join
* Set operators, UNION, INTERSECT, MINUS
* Combining Join with UNION
* Performance considerations

**Reading:** Chapter 5

**Exercise/Assignment:** See online course session

**Week 4, Session 4, SQL Built-in Functions**

* SQL built-in Functions
* Numeric functions - CEIL, FLOOR, ROUND, TRUNCATE, etc.
* String functions - CONCAT, LENGTH, SUBSTR, REPLACE, etc.
* The CASE expression, 2 flavors
* Date functions - MySQL and Oracle
* Current date, date manipulation, date formatting

**Reading:** Chapter 7 (Skip aggregate functions), chapter 12

**Exercise/Assignment:** See online course session

**Week 5, Session 5, Aggregating and Grouping**

* Aggregating and Grouping
* Aggregate functions - SUM, COUNT, AVG, MIN, MAX
* The GROUP BY clause
* The HAVING clause
* Finding Duplicate Records
* GROUP BY with ROLLUP feature
* The ORDER BY clause Pivoting rows into columns

**Reading:** Chapter 7 (Aggregate functions), Chapter 4

**Exercise/Assignment:** See online course session

**Week 6, Session 6, Select Sub-Queries**

* Using SELECT Sub-Queries
* Subqueries as filters
* Subqueries as inline views
* Subqueries as additional derived columns
* Correlated Subqueries
* Where [NOT} EXISTS in Subquery
* Finding the last record from a set
* Pivoting rows into columns

**Reading:** Chapter 6

**Exercise/Assignment:** See online course session

**Week 7, Session 7, Database Design**

* Database Design
* The Logical and Physical Model
* Understanding data normalization
* First normal form
* Second normal form
* Third normal form
* Pros & cons of data normalization
* De-normalizing data
* Entity relationships
* One-to-one relationship
* One-to-many relationship
* Many-to-many relationship
* Designing Self-join relationship
* Designing for an ODS (Reporting Database)
* Designing for a Data Warehouse

**Reading:** Chapter 8

**Exercise/Assignment:** See online course session

**Week 8, Session 8a, Creating Database Objects**

* Creating database objects
* What is a primary key?
* What is a foreign key?
* What is an index?
* Creating tables
* SQL data types
* Adding a primary key
* Adding constraints
* Creating Indexes
* Altering table definition
* Dropping tables
* MySql Auto Increment
* Oracle Sequences and Identity

**Reading:** Chapter 9, 10, 15

**Exercise/Assignment:** See online course session

**Week 8, Session 8b, Inserting, Updating and Deleting Data**

* Manipulating data in tables
* Adding data with the INSERT statement
* INSERT with a SELECT statement
* Changing data with the UPDATE statement
* UPDATE with a SELECT statement
* Removing data with the DELETE statement
* DELETE with a SELECT statement
* The TRUNCATE statement
* The REPLACE statement (MySql)
* The MERGE statement (Oracle)

**Reading:** Chapter 11

**Exercise/Assignment:** See online course session

**Week 9, Session 9, Advanced Topics**

* Advanced Topics
* Creating and using views
* Using the Data Dictionary – MySql
* Using the Data Dictionary – Oracle
* The show statement (MySql)
* Loading data from a file
* Unloading data into a file
* Importing a database or table(s)
* Exporting a database of table(s)

**Reading:** Chapter 13, 18

**Exercise/Assignment:** See online course session

**Week 10, Session 10, Final Exam**

* Final Exam

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

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

1. Policies - You are responsible for reading, understanding, and complying with [University Policies and Guidelines](http://www.nyu.edu/about/policies-guidelines-compliance.html), [NYU SPS Policies and Procedures](http://sps.nyu.edu/academics/academic-policies-and-procedures.html), and [Student Affairs and Reporting](https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/student-services.html).

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](https://www.nyu.edu/students/communities-and-groups/student-accessibility.html). If you are interested in applying for academic accommodations, contact the [Moses Center](https://www.nyu.edu/students/communities-and-groups/student-accessibility/academic.html) 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](https://www.nyu.edu/students/communities-and-groups/student-accessibility.html) as soon as possible ([mosescsa@nyu.edu](mailto:mosescsa@nyu.edu) | 212-998-4980).

3. 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](https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/university-calendar-policy-on-religious-holidays.html) for the complete policy.

4. 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](https://www.nyu.edu/servicelink/KB0018471), 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](https://www.sps.nyu.edu/homepage/student-experience/policies-and-procedures.html) page.

5. 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.