

# Syllabus

## Basics

Course Title and Number: ANOP 242

Instructor: Jose Zenteno

Term/Year: Spring 2026

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Class location & meeting time(s): HOLM 102

TR 8:15 AM - 9:35 AM

## Course Description

In today's data-driven world, databases are the backbone of any organization. This course provides a comprehensive introduction to the world of databases, covering fundamental concepts, design principles, and practical applications. Students will gain hands-on experience with relational databases and cloud data warehouses, the industry-standard SQL language, and explore the exciting intersection of database technology with cloud computing and generative AI.

### Topics Covered:

- **Database Fundamentals:** Explore the role of databases in managing information, different database models, and key concepts like data integrity and consistency.
- **Relational Database Design:** Master the principles of relational database design including normalization, and schema creation.
- **SQL Programming:** Learn to use SQL to define, manipulate, and query data within a relational database management system (RDBMS). Cover essential SQL commands for data definition, data manipulation, data analysis, and data security
- **Cloud Computing:** Introduction to cloud-based datawarehousing services like Google BigQuery and their advantages in terms of scalability, availability, and cost-effectiveness.
- **Generative AI and Databases:** Explore the emerging applications of generative AI in database contexts, such as sentiment analysis, data enrichment, entity extraction, content generation and image and video analysis.

### Learning Outcomes:

By the end of this course, students will be able to:

#### **Design and implement a relational database, with a focus on BigQuery:**

- Understanding relational database concepts and how they apply to cloud data warehouses like BigQuery.
- Creating datasets and tables within BigQuery, defining schemas, and choosing appropriate data types for optimal storage and query performance.
- Designing efficient data models for analytical workloads in BigQuery, considering partitioning, clustering, and data denormalization techniques.
- Ingesting data into BigQuery from various sources (e.g., CSV, JSON, Avro, Parquet) using different methods (e.g., batch loading, streaming ingestion).
- Managing access control and security within BigQuery using IAM roles and permissions.

#### **Write efficient SQL queries to retrieve and manipulate data in BigQuery:**

- Mastering standard SQL syntax and BigQuery's extensions for advanced analytics.
- Writing complex queries involving joins, subqueries, window functions, and aggregate functions for data analysis.

- Optimizing SQL queries for performance in BigQuery, considering query execution plans, cost estimation, and best practices for large datasets.

### **Understand the benefits and challenges of cloud-based database solutions, specifically BigQuery:**

- Understanding the architecture and features of BigQuery as a serverless, highly scalable data warehouse.
- Evaluating the advantages of BigQuery for data analytics, including its speed, scalability, cost-effectiveness, and integration with other Google Cloud services.
- Identifying the challenges of using BigQuery, such as cost management for large queries and data storage, data governance, and security considerations.
- Comparing BigQuery with other data warehousing solutions and understanding when it is the appropriate choice.

### **Grasp the potential of generative AI to enhance database applications and data analytics, particularly within the BigQuery ecosystem:**

- Exploring how generative AI can be used for data generation and augmentation in BigQuery, for tasks like synthetic data creation for testing and training machine learning models.
- Understanding how Large Language Models (LLMs) can be used to generate SQL queries for BigQuery using natural language prompts, simplifying data access for non-technical users.
- Understanding the ethical implications and potential biases associated with using generative AI in data analytics and database applications within BigQuery.
- Leveraging generative AI within BigQuery using Gemini to perform tasks like sentiment analysis, data enrichment, entity extraction, content generation, and image analysis by crafting effective prompts. They will gain practical experience in applying these techniques to real-world data scenarios, enhancing their data analysis and insights generation capabilities.

### **[Google Cloud Data Analytics Professional Certificate:](#)**

This course is designed to equip you with the skills necessary for a successful career in data analytics. Through a series of hands-on courses, you will:

- Learn to analyze data effectively.
- Develop skills in visualizing data insights.
- Gain proficiency in using Google Cloud tools for data management and processing.

No prior experience is required, and the program prepares you for entry-level data analyst roles. A valuable and industry-recognized Google Cloud Data Analytics Certificate is provided free to all enrolled students who complete the required tasks thanks to our partnership with Google.

### **Why Cloud Data Analytics**

Cloud data analytics enables global data sharing and real-time access, empowering stakeholders with faster insights and tapping into a multi-billion dollar market. By leveraging cloud computing, data analysts prepare, process, and analyze data to drive key business decisions and provide data-driven recommendations.

## Logistics

### Method of Instruction

The course will consist of 26 in classroom sessions with both lectures and professor-assisted labs that will be completed as a team within small groups. The labs will be completed via the [Google Cloud Skills Boost](#) program that will grant you access to cloud-resources and activities that mimic real-world scenarios.

This course will grant you with free credits to access the cloud-based labs and resources assigned to our cohort after you create an account using your Bucknell email. During the first week of the course, you will receive an email from Google Cloud Skills Boost ([noreply@cloudskillsboost.com](mailto:noreply@cloudskillsboost.com)) notifying you that you have been invited to join a Google Cloud Career Launchpad cohort.

To enhance your learning, this course offers 15 podcasts on [Spotify](#), each designed to provide engaging conversations about the lecture material. I highly recommend listening to the corresponding podcast before each lecture and participating in the discussion by leaving a comment on each episode. If you're unable to access Spotify, please reach out to me so we can find an alternative.

### Office Hours

This semester I will hold office hours by appointment only. To schedule a time to meet, please request an appointment either before or after class or via email. These meetings are a time when you can come to ask me for assistance in understanding course material or assignments, or they can merely be an opportunity to chat with me about the course or how the course relates to current events, college more generally, or anything else you want to talk about with me. Do not feel like you need to have a "good" question or reason to meet - you are welcome to reach out!

### Accessibility Resources

Any student who may need an accommodation based on the impact of a disability, should contact the Office of Accessibility Resources (OAR) at 570-577-1188 or [OAR@bucknell.edu](mailto:OAR@bucknell.edu). The office will help coordinate reasonable accommodations for those students with documented disabilities. Please visit <https://www.bucknell.edu/Accessibility> for more information about the OAR.

### Texts and Resources

All cloud-resources, labs, and podcasts will be accessible to you at zero-cost. If you have any issues with accessing any of the materials, please reach out to me to find a way to support you.

### Accessibility Resources

*A disability statement **must** be included in your course syllabus and faculty should make a related announcement during the first class.* Example statements can be found [in the appendix](#). More information can be found on the [Office of Accessibility Resources website](#).

## Scope and Sequence

### Class Structure

We will be meeting in HOLM 102 in 26 different occasions for both lectures as well as classroom labs to be completed in small groups with the professor assisting the students as needed. We will also have two classes that will be utilized to help you catch up with my goal of every student completing the Google Cloud Data Analytics Professional Certificate.

### Grading

This course evaluates your progress through a combination of industry certification milestones, practical project application, and regular assessments of your technical fluency.

#### Grade Breakdown:

Component	Weight	Description
Google Cloud Certification	50%	Proportional to the % of certificate activities completed.
Group Project	25%	Strategic analysis of "TheLook" eCommerce dataset.
In-Class Quizzes	25%	12 random quizzes (Top 10 scores count).

### Component Details

#### 1. Google Cloud Data Analytics Professional Certificate (50%)

The certificate program consists of approximately 101 hours of content, including videos, quizzes, laboratory exercises, and readings, distributed across five constituent courses. Given the 14-week course duration, students are expected to dedicate approximately 7 hours per week to these activities. Your grade for this portion is directly proportional to the percentage of certificate activities completed by the end of the semester. This prioritizes the acquisition of practical skills and a recognized industry credential.

#### 2. Final Group Project (25%)

You will work in consulting teams to analyze the "TheLook" eCommerce dataset. This project requires you to apply the skills learned in class—including SQL joins, window functions, and Generative AI (Gemini)—to identify operational inefficiencies and propose strategic changes for the new fiscal year. Teams will produce a professional presentation and a technical notebook.

### 3. In-Class Quizzes (25%)

To ensure consistent engagement and mastery of SQL concepts, there will be **12 quizzes** administered on random class days throughout the semester.

- **Format:** These will be short, auto-graded assessments (approx. 10 questions) focused on recent lecture topics.
- **The "Top 10" Policy:** Only your highest 10 quiz scores will be counted towards your final grade. This means you have two "drop" days automatically built into the grading structure. Exceptions for students with documented, extended absences (beyond the two allotted drops) due to serious illness or university-sanctioned events will be handled on a case-by-case basis.

Our Grading Scale:

Letter Grade	%	Bar
A	94 and above	Superior achievement
A-	90 to 93.99	
B+	87 to 89.99	
B	84 to 86.99	High pass
B-	80 to 83.99	
C+	77 to 79.99	
C	74 to 76.99	Pass
C-	70 to 73.99	
D	60 to 69.99	Low pass
F	Less than 60	Failing work

## **Class Policies and Expectations**

### Generative AI Policy

This course embraces the use of Generative AI as a powerful tool for data analysis and productivity. You are encouraged and sometimes required (e.g., in the Final Project) to use tools like Gemini to generate SQL queries, debug code, or brainstorm strategic insights. However, you must adhere to the following principles:

- **Understanding is Mandatory:** You may use AI to generate code, but you must be able to explain every line of that code if asked. This understanding will be verified via the in-class quizzes, which are designed to test the manual logic behind the code. Submitting code you do not understand is a violation of academic integrity.
- **Attribution:** If you use AI to generate a significant portion of a narrative or a complex algorithm, you should cite it (e.g., "SQL query optimization suggested by Gemini").
- **Verification:** AI can hallucinate. You are responsible for the accuracy of any facts, data, or code output produced by AI tools.

### Academic Engagement

Courses at Bucknell that receive one unit of academic credit have a minimum expectation of 12 hours per week of student academic engagement. Student academic engagement includes both the hours of direct faculty instruction (or its equivalent) and the hours spent on out of class student work.

### Academic Responsibility and Student Conduct

#### **Bucknell University Honor Code**

As a student and citizen of the Bucknell University community:

- I will not lie, cheat or steal in my academic endeavors.
- I will forthrightly oppose each and every instance of academic dishonesty.
- I will let my conscience guide my decision to communicate directly with any person or persons I believe to have been dishonest in academic work.
- I will let my conscience guide my decision on reporting breaches of academic integrity to the appropriate faculty or deans.

### Attendance / Class Participation Policy

Because successful project completion depends on all team members contributing, it is expected that all students will participate in all classes and labs, which means arriving on time and being prepared. However, if you are not feeling well, please email your instructor and team prior to class or lab and do NOT come to class. It is your responsibility to work with your instructor and team members to catch up and make up what you missed during your absence.

### Religious Observance

Bucknell University recognizes the value of religious practice and seeks to accommodate students' commitment to their religious & spiritual traditions whenever possible. When conflicts between holy days or other religious practice and academic scheduling arise, I will make every effort to allow students to adhere to their tradition, including - when possible - excusing class absences and allowing make-up work.

A student anticipating the need to miss a class for religious reasons should notify me as early in the semester as possible - understanding that last-minute requests may not be able to be accommodated. A form for notification is available through the Office of Religious & Spiritual Life if you wish to use it. We can then have further conversation to shape a final agreement. If you have questions or concerns or need support, you can contact Religious & Spiritual Life at [Chaplain@bucknell.edu](mailto:Chaplain@bucknell.edu).

## **Equity & Inclusion**

### Bucknell Diversity Policy (Bucknell Catalog, 2022-23)

Bucknell University does not discriminate on the basis of race, color, national origin, sex, disability, religion, age, veteran status, gender identity, marital status, sexual orientation, gender expression, or any characteristic protected by law in its educational programs and activities, admissions or employment.

### Solidarity Statement

Bucknell University strives to be a community comprising diverse intellectuals who are dedicated to the creation of a safe and inclusive campus free from discrimination and prejudice. As a member of this community, I will respect the diversity of all individuals, including, but not limited to, their sex, gender, identity, expression, race, ethnicity, age, class, citizenship, sexual orientation, nationality, socio-economic status, religion, physical ability and mental ability. I will commit to educating myself about cultures, identities and experiences other than my own. I will actively and safely intervene when derogatory and discriminatory behaviors are observed. I will honor the values and perspectives of the individuals that make up our community. I will be cognizant of my actions, whether intentional or unintentional, and hold myself accountable for their effects. I will strive to understand the diverse world around me, and to actively practice these ideals regardless of prior personal views. As a Bucknellian and a member of this community, I vow to uphold the statements highlighted in this solidarity creed, both now and in the future.

### Equity Statement

All students are welcome in this course and have a right to be fully respected. While I strive to construct a course environment that foregrounds trust, there are likely times throughout this course when individuals may feel uncomfortable, angry, challenged, and a host of other emotions. Instead of creating a “safe” space, I seek to create a “brave” space with this course. To this end, I ask the following of you:

- If you have an issue that influences your learning (you are a second language learner, you have a learning disability, psychological disability, etc.), please speak to me about it so we can discuss any necessary arrangements. All conversations will be held in strict confidentiality.
- If you desire any accommodations with regard to religious holidays, please let me know so we can modify the schedule of requirements accordingly.
- If you have been discriminated against in any way for any reason in the course of this educational experience, please speak to me about it so we can discuss any necessary responses. Should you feel uncomfortable speaking with me, please contact our department chair, or Associate Dean in the Dean’s Office (undergraduates) or Director of Graduate Studies (graduate students).

### **Student Mental Health Resources**

In this classroom and on Bucknell’s campus we support mental health efforts. Any student who is struggling and believes this may impact their performance in the course is encouraged to contact their Associate Academic Dean or the Dean of Students at 570-577-1601 for support. Furthermore, please approach me if you are comfortable in doing so. This will enable me to provide resources and support. If immediate mental health assistance is needed, call the Counseling & Student Development Center at 570-577-1604 (24/7).

You are also encouraged to register for a **Uwill** account for expanded therapy options at no cost. Uwill provides students with access to a therapist of their choice via the mode of their choice—video, phone, chat or messaging. Teletherapy services are available during the day, as well as evenings, weekends and holidays.

To access the Uwill platform, visit [app.uwill.com](http://app.uwill.com). From there, register with a Bucknell email address. You will soon receive an email confirmation to complete the registration process. After confirming your address, you can select a counselor and schedule an appointment.

#### Resource Links:

- For more information about CSDC services, please visit the [CSDC website](#).
- The CSDC has created a [robust catalog of resources](#) for faculty and staff, both for yourselves and as you support students.
- Check out the [Guide for Emotional Health and Well-Being](#)
- A conversation that needs to be had about [supporting students](#)
- Statistics Links:

- [Startling College Mental Health Statistics](#)
- [Pandemic Impacts on College Students' Mental Health.](#)