

[SQL and Process Optimization for the Business Analyst](#)

Effective: 8/18/2020 (SUBJECT TO CHANGE; visit course site regularly for updates)

08/24/2020-12/11/2020

Section 01, CRN 18504, MW 09:00am-10:15am

Section 02, CRN 18505, MW 10:30am-12:00pm

Room: Jepson Hall G-28 (Computer Lab in the basement of Jepson Hall)

Overflow Room: Jepson Hall G-24 (Jepson Hall basement)

Academic Calendar: <https://registrar.richmond.edu/planning/index.html>

Instructor: Thomas Mattson

Office: Queally 381, Office Phone: (804) 287-6895

Official Office Hours: Tuesday & Thursday 2:15pm-4:15pm and by appointment

Note: I am generally in my office during normal business hours every day (except when I am teaching) so feel free to stop by whenever the need arises. I will also make sure that I am available on Zoom during times that are convenient for my remote students who are multiple time zones away from Richmond.

E-mail: mattson@richmond.edu

Course Overview

This course introduces common techniques for relational data management, including conceptual modeling and Structured Query Language (SQL). Students will learn how to construct a relational model to link data that are extracted from multiple systems. Students will learn the pros and cons to using a database management system to implement these relationships instead of doing this in your analytics script in Python, R, or SAS.

This course will also cover topics from business process re-engineering and process optimization given a set of constraints. For instance, how can an organization optimize its portfolio of businesses, its use of employees, its capital, or its product allocation given the constraints associated with each particular problem? To complete these optimization problems, students will extract the necessary data from their relational databases using a series of SQL statements.

This course builds on the content from MGMT 325/225, especially the relational modeling topics. We will discuss the importance of constructing normalized relational models to link data that get extracted from multiple systems. The core difference between MGMT 325/225 and this INFO 302 course is that this course will no longer rely on point-and-click database management systems. Instead, you will have to write SQL statements to load your data and extract the appropriate set of data that you need to analyze.

Learning Objectives

- Conceptually understand the strategic challenges associated with analytics, evidenced-based management, and big data.
- Enhance your relational modeling skills by modeling a variety of different business & analytics scenarios.
- Develop a working knowledge of SQL using MySQL (but the SQL skills should be extendable to other relational database platforms).
- Understand how to setup and execute different types of constrained optimization problems.

- Continue to develop your “data analytical” thinking skills (i.e., critically think like a data analyst).
- Further develop your sense of integrity and learn how to be an honorable business or data analyst when applying analytics to optimization problems.

Software

All of the video tutorials will be developed on Windows machines. However, each piece of software should work on a MAC but the workflow might differ on a MAC relative to a Windows machine. Therefore, the instructional materials might not be 100% identical if you are following along on a native MAC machine. My suggestion is to install bootcamp or parallels on your MAC if you want to use your personal machine (see <https://www.parallels.com/landingpage/pd/windows-on-mac/> to help you get started setting your MAC to run Windows). The University help desk should also be able to assist you in setting up your MAC to run Windows. You can also remote desktop into a lab machine if you do not want to install Windows on your MAC or if your Windows machine is not powerful enough (<http://bigpine.richmond.edu/maps>).

1. Microsoft Excel & Solver
2. Latest Version of Tableau (<http://www.tableau.com/products/desktop>). Tableau will send me the student license key at the start of the semester, which I will forward to you once I receive them. My expectation is that you know Tableau from the MGMT 325/225 pre-requisite. You will use Tableau for your final group project.
3. MySQL & MySQL Workbench (<https://dev.mysql.com/downloads/workbench/>). To run the load data local statement, you will have to use the 6.3.4 version of the Workbench. The 8.0 version of the Workbench has this statement disabled, which will limit your ability to use our RSBDB server.

NOTE: You can load the entire server on your personal laptop or you can just load the workbench on your laptop. A few of the data sets are quite large so you will need some excess storage capacity and ample processing power to perform a few of the exercises locally. To connect to the RSBDB server, you will have to connect to the VPN so you need to install it (Windows: <https://spidertech.net.richmond.edu/TDClient/1955/Portal/KB/ArticleDet?ID=88472> or MAC: <https://spidertech.net.richmond.edu/TDClient/1955/Portal/KB/ArticleDet?ID=88388>)

4. The statistical package is still to be determined because I need to test the MySQL driver on the lab machines. Whichever package works seamlessly in the lab environment will be the one that we will use in this class.

General Course Policies & Guidelines

Class preparation & debriefing: To be successful in this course you should expect to devote 10-14 hours each week in class, reading and studying the material, and preparing assignments. Most of the tools and techniques require repetition to learn. How much repetition is required will vary from individual to individual. As such, preparation will require some combination of repeating the in-class exercises, completing the homework problems, and reading the appropriate references. The in-class mini-cases/examples will require you to have the homework completed before the start of the class period in order to successfully follow along.

The instructor as resource: “To teach” means to “pass on knowledge,” while “to learn” means “to acquire knowledge and skills.” As course instructor, my job is to teach you what I know and understand about data analysis by organizing the course around important topics, key instructional materials and assignments while acting as a facilitator, resource, and guide. You can ask me questions and ask me for extra help and I will do my best to assist you, but it is your job to learn (even when learning is hard work)!

I took this position because I enjoy teaching. I genuinely care about you and your progress in the class. If you have a problem, complaint, comment, concern, etc., **please** schedule an appointment or drop in during open office hours. If something is not working for you, don't wait until the very end of the semester to speak up. Come in and speak with me so we can work together to maximize your experience in this course.

Expectations for student behavior: I expect each student to demonstrate **respect** for his or her fellow students individually and as a class, to me as your instructor, to the Robins School of Business as a place of learning – and to himself or herself. In addition to the typical ways we should be respectful (e.g., language use, politeness, cooperation, openness to new ideas, etc.), being respectful means **no cheating and no plagiarism**. To be clear, **cheating** includes, but is not limited to, copying someone else's work, with or without their knowledge, and turning it in as your own work. **Plagiarism** includes, but is not limited to, copying intellectual property from others (on the web, in books, etc.) and presenting it as your own work, without proper citation. If I identify instances of cheating or plagiarism, ***the students involved will receive a failing grade (F) for the class and instances of cheating or plagiarism will be reported to the Honor Council for possible further sanctions.*** Make sure you familiarize yourself with Richmond's honor code (<http://studentdevelopment.richmond.edu/student-handbook/honor/the-honor-code.html>). Not knowing the policies and procedures related to my course and the University of Richmond is not an excuse to violate those policies and procedures. *When in doubt, don't do it and ask me for clarification.*

Class Participation & Attendance: My assumption is that all students who are taking my class are adults. If you, as an adult, choose to miss class on a given day, I assume that 1) you understand that you are missing a component of the class, 2) you have decided that whatever you have chosen to attend in lieu of class is more important than what is happening in class that day, and 3) you are willing to accept any consequences of missing what happens in class that day (lecture material, interaction with your classmates, classroom presentations, exams, and so on).

Religious Observance Policy: Students needing to miss class because of religious observance should contact me within the first two weeks of the semester to discuss the absence. The University's full religious observance policy may be found here (<http://registrar.richmond.edu/services/policies/religiousobsv.html>).

Other Resources Available to Students:

If you experience difficulties in this course, do not hesitate to consult with me. There are also other resources that can support you in your efforts to meet course requirements.

Academic Skills Center (asc.richmond.edu): Assists students in assessing their academic strengths and weaknesses; honing their academic skills through teaching effective test preparation, critical reading and thinking, information conceptualization, concentration, and related techniques; working on specific subject areas (e.g., calculus, chemistry, accounting, etc.); and encouraging campus and community involvement. Tutors will be available virtually. The on-call peer-tutors available for these appointments are listed in the Box file: [On-Call Online Tutors \(https://richmond.box.com/s/dpe37chr2zodr3o1amtj8omjk72v2ktb\)](https://richmond.box.com/s/dpe37chr2zodr3o1amtj8omjk72v2ktb). Email [Roger Mancastroppa \(rmancast@richmond.edu\)](mailto:Roger.Mancastroppa@richmond.edu) and [Hope Walton \(hwalton@richmond.edu\)](mailto:Hope.Walton@richmond.edu) for appointments in academic and life skills to request a Zoom conference.

Boatwright Library Research Librarians: (library.richmond.edu/help/ask/ or 289-8876): Research librarians help students with all steps of their research, from identifying or narrowing a topic, to locating, accessing, evaluating, and citing information resources. Librarians support students in their classes across the curriculum and provide library instruction, tutorials, research guides, and individual help. All research support will be provided online or by appointment and students can contact a librarian for help via email (library@richmond.edu), text (804-277-9ASK), chat, or Zoom (by appointment).

Career Services: (careerservices.richmond.edu or 289-8547): Can assist you in exploring your interests and abilities, choosing a major or course of study, connecting with internships and jobs, and investigating graduate and professional school options. We encourage you to schedule an appointment with a career advisor early in your time at UR.

Counseling and Psychological Services (caps.richmond.edu or 289-8119): Assists currently enrolled, full-time, degree-seeking students in improving their mental health and well-being, and in handling challenges that may impede their growth and development. Services include brief consultations, short-term counseling and psychotherapy, skills-building classes, crisis intervention, psychiatric consultation, and related services.

Disability Services (disability.richmond.edu) The Office of Disability Services works to ensure that qualified students with a disability (whether incoming or current) are provided with reasonable accommodations that enable students to participate fully in activities, programs, services and benefits provided to all students. Please let your professors know as soon as possible if you have an accommodation that requires academic coordination and planning.

Speech Center (speech.richmond.edu or 289-6409): Assists with preparation and practice in the pursuit of excellence in public expression. Recording, playback, coaching and critique sessions offered by teams of student consultants trained to assist in developing ideas, arranging key points for more effective organization, improving style and delivery, and handling multimedia aids for individual and group presentations. Remote practice sessions can be arranged; we look forward to meeting your public speaking needs.

Writing Center (writing.richmond.edu or 289-8263): Assists writers at all levels of experience, across all majors. Students can schedule appointments with trained writing consultants who offer friendly critiques of written work.

Assignments & Deliverables

Modeling & Loading Test: This *individual* test will primarily cover relational modeling and loading data into your relational model. The test may also cover a few of the conceptual readings.

SQL Select Queries Test: This *individual* test will primarily cover SELECT queries.

Constrained Optimization Test: This *individual* test will test your ability to extract data from a populated relational database and performed a constrained optimization analysis.

NBA Case Study: Your *group (or individual if you choose)* will perform a constrained optimization problem related to the National Basketball Association.

Homework Assignments & In-class Activities: After most class meetings you will be given an assignment to complete. I will typically not collect these activities but they are required. If I suspect that the class as a whole is not doing these assignments, I will collect them. Failure to complete them will result in negative points (from -1 to -5 points) towards your total points.

Adding up the points

	Points	%
Modeling & Loading Test (<i>Individual</i>)	25	25%
SQL Select Queries Test (<i>Individual</i>)	25	25%
Constrained Optimization Test (<i>Individual</i>)	25	25%
NBA Case (<i>Groups or Individual</i>)	25	25%
Total	100	
<u>NOTE:</u> Failure to complete the homework assignments (when I collect them) will result in anywhere between -1 and -5 points towards your final grade.		

A >=93%	A- >=90% & <93%	B+ >=87% & <90%
B >=83% & <87%	B- >=80% & <83%	C+ >=77% & <80%
C >=73% & <77%	C- >=70% & <73%	D+ >=67% & <70%
D >=63% & <67%	D- >=60% & <63%	F < 60%

TENTATIVE Course Schedule

Part 1 – Course Introduction, Modeling and Loading Data	
Weeks 1 to 6 8/24 - 9/30	<p><u>Topics:</u></p> <ol style="list-style-type: none"> 1. General Introduction to Optimization, Big Data, and Evidence-Based Management 2. Relational Database Core Concepts 3. Modeling Analytics problems using relational databases 4. Action queries (update, delete, and insert) 5. Loading data into a normalized relational database
Test for Part 1 tentatively scheduled for 9/30	
Part 2 – Select Queries	
Weeks 7 to 9 10/5 – 10/21	<p><u>Topics:</u></p> <ol style="list-style-type: none"> 1. Structure of a SQL statement 2. Group By queries 3. Joins 4. Sub queries
Test for Part 2 tentatively scheduled for 10/21	
Part 3 – Constrained Optimization using Linear & Logistic Regression	
Weeks 10 to 13 10/26 - 11/18	<p><u>Topics:</u></p> <ol style="list-style-type: none"> 1. Linear Regression Review 2. Constrained Optimization 3. Logistic Regression 4. Constrained Optimization using Linear & Logistic Regression Models
Test for Part 3 tentatively scheduled for 11/18	
Week 15	Project Work
Project due on the date of the final exam, which will vary depending on the section.	