RUTGERS
School of Business | Camden

53:623:517:01 Data Management and Business Intelligence

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Contact Information	**Office:** 438 BSB **Phone:** 856 225 6694 **e-mail:** sundares@camden.rutgers.edu
Class Meetings	Wednesdays 6:00 pm – 8:50 pm, BSB 336
Office hours	Wednesdays: 4:30 pm to 5:30 pm Thursdays: 7:00 pm – 8:00 pm (online) other times by appointment
Course LMS	Canvas

Course Overview:

Data science supported by AI is providing interesting new business insights. This course will cover the fundamentals of Data Management as well as the elements of business intelligence. You will get an overview of how the new AI and analytics technologies work together and how businesses may benefit from employing these strategically.

A good understanding of data management concepts and a working knowledge of the tools of business intelligence are becoming indispensable for business managers. This course is designed to enable students to learn the underlying principles of data management and apply them using the SQL language. Moreover, business intelligence concepts and functions will be introduced through the use of the R programming language. Specific skills such as data manipulation, importing, creating, modifying, filtering, summarizing, reshaping and analyzing data sets and their application will be explored using the "R" language. The course will help students think about data, its business value, as well as extracting meaningful information for decision support. Further, students will be able to analyze the data and visually represent their findings using advanced graphical presentations in practical business contexts. There is an emphasis on hands-on applied work to enable students to confidently employ these tools for analysis and presentation.

Course Objectives:

Specifically the course aims to help you:

- clearly understand the role of data science and AI in revolutionizing businesses
- understand how business analytics driven by AI and ML yields unprecedented business insights
- understand humans and machines working together to reach high productivity
- find opportunities for strategic advantage from a host of new technologies
- understand the basic foundations of data management, the principles of relational databases and their role in analytics.
- develop applied skills to create tables and other structures for storing and organizing data.
- use SQL queries to filter, modify and summarize and generate reports from relational data to answer business questions and develop insights
- learn the basics of the "R" language
- conduct data analytics operations on business data
- use visualization tools to present the data analysis results
- survey some of the new developments in AI and data science
- develop a versatile vocabulary about data management and business intelligence
- apply the concepts in practical business scenarios

Required Course Materials

Required Texts:

HBR's 10 Must Reads on AI, Analytics and the New Machine Age, Harvard Business Review Press, 2019.
ISBN: 9781633696846

SQL Queries for mere mortals, 4e, by John L. Viescas, Addison-Wesley Professional, 2018.
ISBN: 9780134858333, e-text version available.

R for Everyone Advanced Analytics and Graphics, 2nd edition, by Jared P. Lander, Addison-Wesley Professional, 2017**.**
ISBN: 9780134546926; e-text version available.

Other web-based readings (articles, business clippings and web sites) will be assigned regularly.

There is a wide variety of free texts and material available on the web on these topics. In addition, **Rutgers-LinkedIn site** provides some excellent tutorials/classes both for beginning and advanced SQL and R.

Software: The "official" software for the class will be **MySQL Workbench** and **R-Studio**. **MySQL Workbench** and **R-Studio** are available in class lab computers. Free versions of both of these software are available for installing on personal computers.
The instructor may require you to turn on video features during online conferences and the use of respondus/lockdown browser for exams.

Prerequisites

Although there are no "formal" prerequisites for this course, please note that this course is designed as an advanced elective course and will assume that you have completed the core MIS course, and have reasonable background in statistics (from the foundation or business analytics classes). You are expected to be able to install the two required software programs. Detailed instructions will be provided in the course materials. You will also be using these two software programs extensively to master the contents of the course. You do **not** need any prior programming experience; all the necessary skills will be taught in the course. However, it will be helpful if you have an aptitude for hands-on work, especially "algorithmic thinking" and working with code as required.

Class Materials

All class materials can be obtained via **Canvas**. Usually, the lecture notes and class discussions will be available in Canvas by the start of the week, often earlier. You are strongly encouraged to access the course via Canvas several times a week.

Email Communication:

Note that during the week, from Monday until Friday, I will try reply to all e-mails within 24 hours, unless I am traveling. Although, I check my e-mails several times a day, I may not be able to completely answer all e-mails immediately upon receiving them. Note that I may not be available on **weekends** and may not be able respond to weekend e-mails until Monday.

Course Requirements

Item	Weight
Homeworks	**12%**
Participation	**12%**
Project	**14%**
BI Topic Presentation	**6%**
Exam1	**28%**
Exam2	**28%**

Class Participation

The course will be delivered using a combination of lectures, discussions, presentations, and hands-on sessions. Each one of you is expected to prepare for class discussions as indicated in the course schedule, to attend classes, and to contribute to class discussions. In evaluating class participation, I emphasize the quality of participation more than quantity. I try to assess how your contributions enhance both the content and process of a discussion:

- do your comments provide new insights?
- do the comments add to our understanding of the issues or is it frivolous -- an attempt to get "air time" that day?
- are the comments timely and linked to the comments of others?
- are the comments action-oriented or are they simply descriptive statements?
- do the comments move the discussion along by giving a new perspective?
- are the comments clear and concise or obscure and rambling?
- do the comments reflect a concern for maintaining a constructive and comfortable classroom atmosphere?

In addition, you are encouraged to identify and discuss relevant current technology news items from business press reports.

Lastly, you can use the provided **SQLBI Chat** discussion board for informal conversation with your classmates.

Note: As the circumstances (such as university policy, inclement weather or instructor unavailability) require, some classes (or part of them) may be delivered asynchronously via “on-line” mode. Often we will use the “flipped-classroom” model to learn the hands-on material.

Individual Assignments

- There will be approximately 10-12 assignments to be completed by each student **individually**. Most will require the use of MySQL Workbench and/or R-Studio. These assignments are invaluable in helping you master the material. Where asked, please submit computer based assignments in Canvas. **Late Assignments** are generally not accepted.

Project

A course project will be completed as team work. I expect each team to have 3-4 members. The project will involve the choice of a business context, identification and selection of data sources, organization of data, development of business questions and supporting them with SQL queries, conducting data analysis using R and presentation of results. Each team will also present their project to the class. More details will be provided in a separate document.

BI Topic Presentation

Each team will also choose a specific aspect of a BI related technology and/or business application and present it to the class. This will help the students to explore some BI technologies in depth.

Exam Policy:

Two exams are planned. All students will take exam 1 and the final exam during the designated time. **Exam 1** is scheduled on **Mar 12th** and the **final exam on May 14th**, as per university guidelines. Typically, **make-up exams are not offered.** Please take this exam schedule into consideration when you make your travel arrangements. If you have to miss a test for emergencies / university approved reasons, contact me for making alternative arrangements. All exams will be given in the regular classroom unless otherwise posted.

You may be required to take the exam on the Canvas LMS. In such case, once started, the exam must be completed in one continuous sitting without interruption. That is, do not log out until you have completely finished the exam. Any unanswered question will automatically receive a zero grade for that question. There is no penalty for incorrect answers. Ensure that you have a reliable computer, fully charged battery and reliable internet connection before starting the test. Make sure that your computer meets all the requirements and you configure the browser as suggested. **Exams**

may require the use of respondus / lockdown browsers. Hence, use of video features may be required. The materials you can refer to will be explicitly spelled out before each exam.

- **Exam Make-Up Policy**: Typically, make-ups are **not** given. If, you cannot take an exam by the scheduled deadline for a university-approved reason, you must give the professor written notice at least one week in advance so that other arrangements can be made. If the situation does not allow for advance notification (for example, emergency hospitalization), contact the professor as soon as possible after a missed exam. Any student who misses the exam without prior approval of the instructor or a compelling reason will receive a zero grade for that exam. The professor reserves the right to request written documentation to support your absence (such as a doctor's note or military orders).

Grading Policy

Students will be assigned a final grade based on the weighted scored computed using the components indicated above. The final grade will be based very approximately on a normal distribution.

Other Administrative Comments

- **Preparation:** Please come prepared for all classes. Not only your participation grade, but the quality of your learning is substantially enhanced when you come prepared. Being absent from class without prior intimation will affect your class participation points.

- **Attendance:** You are expected to attend class regularly. Although a seating chart will not be used, attendance will be noted informally. If you do miss a class, inform me prior to the class, and obtain class notes, assignments, handouts etc. from me, course web site or a classmate.

- **Name Cards:** Use name cards regularly in class throughout the term.

- **Handouts:** I expect to post most of the material on the course web site.

- **Website:** Please visit the course web site regularly. The course schedule will be revised dynamically. All the current readings will be updated in the course web site regularly.

- **Student Involvement:** You are encouraged and expected to ask questions and to interact with the instructor in class. If at any time during the course, you have questions regarding course-related matters, do not hesitate to contact me. If the scheduled office hours are inconvenient for you and if you want to meet in person, please contact me to arrange an alternative appointment.

- **Feedback:** I welcome your feedback on the content and style of the class. You may choose to provide your feedback in person, via e-mail, or anonymously at any time. Your suggestions will help me to make the class more useful for everybody.

- **Announcements:** Announcements will be periodically made in class about changes in schedules, assignments, exam, readings, project, policies and other class activities. Please keep abreast of the announcements and changes.

Academic Integrity:

For the policy on Academic Integrity please see:
http://academicintegrity.rutgers.edu/academic-integrity-at-rutgers

Academic Integrity means that you must:

- properly acknowledge and cite all use of the ideas, results, or words of others,
- properly acknowledge all contributors to a given piece of work,
- make sure that all work submitted as your own in a course activity is your own and not from someone else
- obtain all data or results by ethical means and report them accurately
- treat all other students fairly with no encouragement of academic dishonesty

Adherence to these principles is necessary in order to ensure that:

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments
- all student work is fairly evaluated and no student has an inappropriate advantage over others
- the academic and ethical development of all students is fostered
- the reputation of the University for integrity is maintained and enhanced.

For instance, you are responsible for preparing and entering your own work and properly referencing the work of others. Cheating, plagiarism, and other types of misconduct are not acceptable. Penalties can include expulsion from the University. You are free to discuss any part of the course materials with your classmates.

However, you are not allowed to discuss (i.e., receive nor give any assistance on) any part of the exams with anyone. You may not refer to sources not permitted nor receive help from outside agencies. If any cheating is found, the most severe sanctions available will be sought.

Students are responsible for understanding the principles of academic integrity and abiding by them in all aspects of their work at the University. Students are also encouraged to help educate fellow students about academic integrity and to bring all alleged violations of academic integrity they encounter to the attention of the appropriate authorities. Violations are taken seriously and will be handled according to University policy.

Student Code of Conduct

The University's Student Code of Conduct can be found at http://studentconduct.rutgers.edu/university-code-of-student-conduct

Violations of the Student Code of Conduct are considered serious infractions of student behavior and students who violate the code are subject to penalties relative to the level of the matter. In general, students may not disturb normal classroom procedures by distracting or disruptive behavior. Violations of the Student Code of Conduct should be reported to the Dean of Students office deanofstudents@camden.rutgers.edu or 856-225-6050.

Covid Guidelines

We will follow all Covid related guidelines that Rutgers University and the Rutgers School of Business – Camden institute.
More details may be found at the Rutgers University/ Rutgers School of Business – Camden web sites.

Disability Services / Student Health and Well-Being Resources:

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: Details are available at Office of Disability Services web site at https://learn.camden.rutgers.edu/disability-services.

Our campus provides a number of student health and well-being resources. Please see https://wellnesscenter.camden.rutgers.edu for

details. A document that contains more information on these resources is available at the course web site.

Course Outline (Tentative)

(In the readings, JV refers to the "SQL Queries for mere mortals," by John Viescas; JL refers to the "R for Everyone: Advanced Analytics and Graphics," by Jared Lander; HBR readings are indicated separately.)

(Please note that the dates indicated for topics and assignments are tentative, and are likely to change depending on the course pace.)

Week 01 Jan 22	**Readings**
Topic : Overview, Introduction to Data Management and Analytics	
Course Overview Introduction to Data Management Relational Databases	JV: Chapter 1
Week 02: Jan 29	
Topic : Relational Databases and SQL / AI for the Real World	
Design Principles for Relational Databases SQL and Query Primer	JV: Chapter 2, 3 Appendix A, B
Hands-on: MySQL Workbench	
HomeWork 1	
HBR Reading: Artificial Intelligence for the Real World	
Week 03: Feb 05 (Asynchronous – online)	
Topic : Simple Queries / Human-AI for Mass Markets	
Simple Queries, Filtering Results Combining Multiple conditions	JV: Chapter 4, 5, 6
Hands-on: MySQL Workbench	
HomeWork 2	
HBR Reading: Personal Style for the Mass Market	
Week 04: Feb 12	
Topic : Data from Multiples Tables / Managing Algorithms	
Join Operations Querying Multiple Tables	JV: Chapter 8
Hands-on: MySQL Workbench	
Homework 3	
HBR Reading: Algorithms need Managers Too	

Week 05: Feb 19	
Topic : Data from Multiples Tables – Continued, Set operations / Marketing in the Age of AI Agents	
More complicated Joins Working with Sets	JV: Chapter 9 JV: Chapter 7, 10
Hands-on: MySQL Workbench	
Homework 4	
HBR Reading: Marketing in the Age of Alexa	
Week 06: Feb 26	
Topic : Aggregating Data / Augmented Reality	
Grouping data Aggregate Functions	JV: Chapter 12, 13, 14
Hands-on: MySQL Workbench	
Homework 5	
HBR Reading: Why Every Organization Needs Augmented Reality	
Week 07: Mar 05	
Topic : More Complex Queries, Populating Databases	
Sub-Queries Complex Queries Creating and Populating Databases, Updating, Deleting Data	JV: Chapter 11 JV: Chapter 18 JV: Chapters15, 16,17
Hands-on: MySQL Workbench	
Homework 6	
Week 08: Mar 12	
Topic : Exam 1	
Topic : Introduction to R and Data Analytics	
R and R-Studio Basics of R	JL: Chapter 1, 2, 3 JL: Chapter 4
Hands-on: R Studio	
Exam 1 – Mar 12	
Mar 17– Mar 23 Spring Break	

Week 09: Mar 26	
Topic : Data Types, Structures and Data Frames in R, Functions in R / Drones	
Basics of R Data structures and Data Frames in R Writing Functions in R Control Statements, Iteration	JL: Chapter 4 JL: Chapter 5 JL: Chapter 8 JL: Chapter 9, 10
Hands-on: R Studio	
Homework 7	
HBR Reading: Drones Go to Work	
Week 10: Apr 02 (Asynchronous Online)	
Topic : Datasets and Loading Data in R	
Getting data into R Loading data from SQL Loading data from Excel Screen scraping and loading data from web sites Data Reshaping in R Text Manipulation	JL: Chapter 6 JL: Chapter 12 JL: Chapter 13
Hands-on: R Studio	
Homework 8	
HBR Reading: Drones Go to Work	
Week 11: Apr 09	
Topic : Graphics in R / Blockchains	
Basic Graphics Scatter Plots Bar graphs, pie charts, Box plots	JL: Chapter 7
Hands-on: R Studio	
Homework 9	
HBR Reading: Blockchains	
Presentation: Team BI Tech Presentation	
Week 12: Apr 16	
Topic : Visualization, Advanced Graphics, Statistical Inference in R / 3D Printing	

Basics of data visualization Advanced Graphics in R Probability Distributions Basic Statistical Analysis	JL: Chapter 7 JL: Chapter 14 JL: Chapter 15
Hands-on: R Studio	
Homework 10	
HBR Reading: 3-D Printing Playbook	
Presentation: Team BI Tech Presentation	
Week 13: Apr 23	
Topic : Predictive Analytics – Linear and Generalized Linear Models/ Collaborative Intelligence	
Simple Linear Regression in R Multiple Linear Regression in R Logistic regression	JL: Chapter 16 JL: Chapter 17
Hands-on: R Studio	
Homework 11	
HBR Reading: Collaborative Intelligence	
Presentation: Team BI Tech Presentation	
Week 14: Apr 30	
Topic : Clustering, Non-linear Models, Time Series / Hub Economy / Project Presentations	
Clustering Decision Trees Time Series	JL: Chapter 22 JL: Chapter 20 JL: Chapter 21
Hands-on: R Studio	
Homework 12	
HBR Reading: Managing Our Hub Economy	
Presentation: Team Project Presentations	
Week 15/16: May 07, May 14	
Topic : Reading Days and Exam 2	
May 01 - Reading Day	
Project Reports Due (May 07)	
Exam 2 –May 14	