FUNDAMENTALS OF MODERN DATA SCIENCE WITH R
DSCI 101 – 001
Spring Semester 2025
MWF 12:35 pm – 1:25 pm
Cuneo Hall Rm. 311

Instructor Information

Instructor: Widad Abdalla Mukhaimer, PhD

Campus Office: 301 Loyola Hall

E-mail: wabdalla@luc.edu

Office Hours:

- *In person*: MW – 2:00 – 3:30 pm
- *Online*: Th – 11:00 am – 1:00 pm

**Note: in person office hours will be held in the back study room on the first floor of Loyola Hall.

Online Office Hours Zoom Link:

Join Zoom Meeting
https://luc.zoom.us/j/88592174242?pwd=X2jo4wLmN4eEv7WDRoqncBzMTftJ6G.1

Meeting ID: 885 9217 4242

Passcode: 303447

Essential Course Information

Course Description: This course is designed to be an introduction to the basics of data science with R. Students will learn the very basics of data science and introductory programming skills for working with data.

Learning Outcomes: Students will learn basic programming skills for working with different types of data as well as data visualization, data wrangling, and data management practices.

Required Textbook: Wickham, H., Cetinkaya-Rundel, M., & Grolemund, G. (2023). *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data* 2nd ed. O'Reilly Media.

PDF of Book: http://r4ds.hadley.nz/

Recommended Textbook: Baumer, B. S., Kaplan, D. T., & Horton, N. J. (2024). *Modern Data Science with R* 3rd ed. CRC Press.

PDF of Book: https://mdsr-book.github.io/mdsr3e/

R and Posit (formerly RStudio)

We will be using/introducing the free statistical software R. While R is the engine, we will use the free and open source IDE (Integrated Development Environment) RStudio to run it. R and RStudio are set up and available on all library computers.

Grading Policy

Students will be evaluated as follows:

Grading Components	Percentage of Total Grade
Participation	5%
Homework	25%
2 Midterms	45%
Cumulative Final Exam	25%

The grading scale is as follows:

A	A-	B+	B	B-	C+	C	C-	D+	D	F
93-100%	90-92%	87-89%	83-86%	80-82%	77-79%	73-76%	70-72%	67-69%	60-66%	0-59%

Participation: students will receive credit for class participation every day. This includes interaction during lectures and interactions during group work. Students who do not attend class will not get the participation points for the day.

Homework: Homework is due approximately every other week. Discussion between classmates is encouraged; however, the final work should be independent. Homework must be submitted through Sakai. Homework turned in after the due date will receive no credit. There are no extensions on homework assignments. If you miss a homework, you will get a score of 0. One lowest homework assignment score will be dropped at the end of the semester.

Partial Exams: There will be two partial exams during the course. The tests will be done in-class or half in-class half take home. The dates of the tests are given in the course schedule (last page). These dates are tentative and may change. There are no makeup tests. Since there are no makeup tests, I will prorate the final exam for one of the lowest tests, this applies to students who miss an exam.

Final Exam: To pass the class and receive credit for the class, **you must take the final exam on Friday, May 2nd from 9 am – 11 am.** You must bring your own laptop to the exam. If you miss the final exam and have a passing grade, you will receive an incomplete for the semester. Students are responsible for filling out the incomplete form. You must take the final to erase the incomplete according to the guidelines of Loyola University. If you miss the final exam and have a failing grade, you will fail for the semester. Final exam will be cumulative.

Additional Course Policy

Academic Integrity: Academic dishonesty can take several forms, including, but not limited to cheating, plagiarism, copying another student's work, and submitting false documents. Academic cheating is a serious act that violates academic integrity. Cheating includes, but is not limited to, such acts as:

- Obtaining, distributing, or communicating examination materials prior to the scheduled examination without the consent of the teacher.
- Providing information to another student during an examination.
- Obtaining information from another student or any other person during an examination.
- Using any material or equipment during an examination without consent of the instructor, or in a manner which is not authorized by the instructor.
- Attempting to change answers after the examination has been submitted.
- Unauthorized collaboration, or the use in whole or part of another student's work, on homework, lab reports, - programming assignments, and any other course work which is completed outside of the classroom.
- Falsifying medical or other documents to petition for excused absences or extensions of deadlines.
- Students must produce the codes for homework and exam problems on their own. Using artificial intelligence (such as ChatGPT) or google searches to copy the answers to those problems is not allowed and constitutes plagiarism.
- Any other action that, by omission or commission, compromises the integrity of the academic evaluation process.

Cheating is unacceptable in this class. You are expected to complete any test on your own. Anyone caught cheating will receive a 0 for the test. If you're caught cheating the second time, you will receive an F for the course. We must file a complaint with the University anytime a student is caught cheating. Additionally, a statement of cheating will be placed in your permanent file. For more details on Loyola's Academic Integrity please refer to the following link:
catalog.luc.edu/academic-standards-regulations/undergraduate/

Tutoring Help: The www.luc.edu/tutoring embodies the mission of Loyola University Chicago by providing academic services and resources which foster development of skills and attitudes necessary to increase the knowledge and academic independence of all students. Through multiple learning services, the Tutoring Center helps to contribute towards student success and growth efforts that are made by Loyola University Chicago. The Data Science Club meets every week in Loyola Hall to help students with the class material. More information on this will be given to students at the start of the semester. *Get help early if you are having difficulty.*

Diversity Equity and Inclusion Statement: The diversity that students bring to this class, in all its forms, is viewed as a resource, a strength, and a benefit. It is my intent to invest in each student's success and attend to each student's learning needs, both in and out of class. It is my intent to present materials and activities that are respectful of diversity, equity and inclusion, and that students from all diverse backgrounds and perspectives be well-served by this course.

Accommodations for Disabilities or Conditions: Loyola University provides reasonable accommodations for students with disabilities. Any student requesting accommodations related to a disability or other condition is required to register with Student Accessibility Center (SAC), located in Sullivan Center, Suite 117. Students will provide professors with an accommodation notification from SAC, preferably within the first two weeks of class. Students are encouraged to meet with their professor individually in order to discuss their accommodations. All information will remain confidential. For more information or further assistance, please call 773.508.3700 or visit https://www.luc.edu/sac/

Title IX: As an instructor, I am a Responsible Campus Partner (RCP) at Loyola. While my goal is for you to be able to engage fully and authentically with our course material through class discussions and written work, I want to be transparent that as an RCP I am required to report certain disclosures of sexual misconduct (including sexual assault, sexual harassment, intimate partner and/or domestic violence, and/or stalking) to the Office for Equity & Compliance. More information can be found here.

Intellectual Property: All lectures, notes, PowerPoints, and other instructional materials in this course are the intellectual property of the professor. As a result, they may not be distributed or shared in any manner, either on paper or virtually without my written permission. Lectures may not be recorded without my written consent; when consent is given, those recordings may be used for review only and may not be distributed. Recognizing that your work, too, is your intellectual property, I will not share or distribute your work in any form without your written permission.

Attendance: Students are expected to attend and participate in class. I will be taking attendance every day. At Loyola, we accommodate observance of religious holidays, but students must inform the instructor in advanced. Click here for more information on the observation of religious holidays.

Important Links

- **Sakai** – Instructor will communicate with students via Sakai and e-mail. All class notes and grades will be posted in Sakai.
  https://sakai.luc.edu/

- **R & RStudio Download**
  https://posit.co/download/rstudio-desktop/

- **Demographic Survey** – Complete by January 22nd
  https://forms.office.com/Pages/ResponsePage.aspx?id=408fApwrJEiDeLvPnsWsy0GW1-51jWZMpmlDitVq_wZUNDdUS09YSkQ1RUFRSzVCWkVET1k3NU9GNS4u

- **Online Office Hours Zoom Meeting Link**
  https://luc.zoom.us/j/88592174242?pwd=X2jo4wLmN4eEv7WDRoqncBzMTftJ6G.1
  Meeting ID: 885 9217 4242
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Tips to Succeed in This Course

1. Come to class ready to learn.
2. Read class notes ahead of schedule. Come to class prepared to solidify the readings through lecturing and group activities.
3. Re-read class notes after lecturing.
4. Class will be composed of lecturing, discussions, collaborative activities, and R practice. Please come to class having done the reading, a charged computer, and ready to discuss and learn in a collaborative manner.
5. Do not skip class. You are expected to attend and participate in class. I will be taking attendance every day.
6. Unless otherwise stated, please put cellphones away and make sure that they are in silent mode. Students should not be using their cellphones during class. In case something urgent happens, the student may step outside of the classroom to attend the call/message.
7. Ask questions! There's no such thing as a dumb question. If you need me to review something, please let me know.

Tentative Course Schedule

Week	Date	Topics
Week 1 Introduction to R	January 13	**First Day of Class** • Syllabus Discussion • Installing R and RStudio • Github Introduction
	January 15	*Coding Basics* • Introducing R & RStudio and its basic components • Introducing packages • Data structure: vectors, matrices, dataframes, tibbles, and basic operations with them. • Types of files: R Script, R Project, and R Markdown.
	January 17	*R Markdown* • Introduction to R Markdown. • How to write R Markdown files from "scratch".

Week	Date	Topics
Week 2 & 3 Conditional Statements, For Loops, and Functions	**January 20**	**Martin Luther King Jr. – Classes Do Not Meet**
	January 22	***What are functions?*** • Introduction to functions/arguments. • Searching for help in R. • Arguments with default values.
	January 24	***Conditional Statements*** • Boolean expressions. • If/else statements
	January 27	***Iterations & for loops***
	January 29	***Creating Functions***
	January 31	***Creating Functions***
Week 4 Data Wrangling	February 3	***Creating Functions***
	February 5	***Introduction to tidyverse – reading & selecting*** • Importing data from an Excel file & from a package. • Selecting columns – select()
	February 7	***Introduction to tidyverse - filtering*** • Filtering rows - filter()
Week 5 Data Wrangling	February 10	***Introduction to tidyverse - mutating*** • Mutating columns – mutate()
	February 12	***Introduction to tidyverse - summarizing*** • Summarizing data – group_by() & summarize()
	February 14	***Introduction to tidyverse – counting & arranging*** • Counting & arranging – count() & arrange()
Week 6 Data Wrangling Exam # 1	February 17	***Introduction to tidyverse – all functions*** • All functions combined
	February 19	**Review for Exam # 1**
	February 21	**Exam # 1**
Week 7 Joining Datasets	February 24	***Joining Datasets - inner*** • What is joining datasets? • Why is it important? • inner_join()
	February 26	***Joining Datasets – left & right*** • left_join() • right_join()
	February 28	***Joining Datasets – full*** • full_join() • joining by more than one column.

Week	Date	Topics
Week 8 Spring Break	March 3	**Spring Break – Classes Do Not Meet**
	March 5	
	March 7	
Week 9 Tidy Data & Data Visualization	March 10	*Tidy data* • pivot wider/pivot longer
	March 12	*Plotting – ggplot()* • one variable plots
	March 14	*Plotting – ggplot()* • two variable plots
Week 10 String & Dates	March 17	*Plotting – ggplot()* • cleaning, beautifying plots
	March 19	*Strings* • stringr
	March 21	*Dates* • lubridate
Week 11 Maps	March 24	*Maps* • Introduction to Map function • Nesting and iterating inside a dataframe
	March 26	*Maps* • More on the family of map functions.
	March 28	**Review Exam # 2**
Week 12 Exam # 2 & Simulations	March 31	**Exam # 2**
	April 2	*Simulations* • What is random sampling? • 1 trial theoretical probabilities
	April 4	*Simulations*
Week 13 Statistics & Interactive Data Visualization	April 7	*Statistics* Introduction to Sampling Distributions & Bootstrapping
	April 9	*Statistics* Introduction to Sampling Distributions & Bootstrapping
	April 11	*Interactive Data Visualization*
Week 14 Interactive Data Visualization & Shiny	April 14	*Interactive Data Visualization*
	April 16	*Shiny*
	April 18	**Easter Holiday – Classes Do Not Meet**
Week 15 Shiny	April 21	
	April 23	*Shiny*
	April 25	*Review Final Exam (Last Day of Class)*
Week 16	**May 2**	**Final Exam**

Last Day to withdraw: March 24th

**Note: These dates are not set in stone. I may change some of these dates around as needed.