



Preparing people to lead extraordinary lives

FUNDAMENTALS OF MODERN DATA SCIENCE WITH R

DSCI 101 - 002

MWF 11:30 am – 12:20 pm

Dumbach Hall Rm. 234

Instructor Information

Instructor: Widad Abdalla Mukhaimer, PhD

Campus Office: 301 Loyola Hall

E-mail: wabdalla@luc.edu

Office Hours:

- *In person:* M – 1:30 – 2:30 pm
TuTh – 10:00 – 11:30 am
- *Online:* W – 1:30 – 2:30 pm

****Note:** in person office hours will be in my office (301 Loyola Hall). However, in the case that a large number of students come to the office at the same time, I will be holding office hours in one of two common areas on the first floor of Loyola Hall. In this case, I will leave a sign on the door of my office.

Online Office Hours Zoom Link:

Join Zoom Meeting

<https://luc.zoom.us/j/86116670399?pwd=t7mTubxnetHmSbN5F6k24xnS6K1bZC.1>

Meeting ID: 861 1667 0399

Passcode: 083060

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 only 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 Monday, December 9th from 1 pm – 3 pm.** 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 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.
- 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 Statement please refer to the following link:
<http://www.luc.edu/cas/advising/academicintegritystatement/>

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. **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/>

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](#) to read the statement about 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 Sept 2nd
https://forms.office.com/Pages/ResponsePage.aspx?id=408fApwrJEiDeLvPnsWsy0GW1-51jWZMpmIDitVq_wZUQzBVSkwzRTNGWTBLR0szOVIGTUw4Q05EQy4u
- **Online Office Hours Zoom Meeting Link**
<https://luc.zoom.us/j/86116670399?pwd=t7mTubxnetHmSbN5F6k24xnS6K1bZC.1>
Meeting ID: 861 1667 0399
Passcode: 083060

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.
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	August 26	First Day of Class <ul style="list-style-type: none">• Syllabus Discussion• Installing R and RStudio• Github Introduction
	August 28	Coding Basics <ul style="list-style-type: none">• 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.
	August 30	R Markdown <ul style="list-style-type: none">• Introduction to R Markdown.• How to write R Markdown files from “scratch”.
Week 2 & 3 Conditional Statements, For Loops, and Functions	September 2	Labor Day – Classes do not meet
	September 4	What are functions? <ul style="list-style-type: none">• Introduction to functions/arguments.• Searching for help in R.• Arguments with default values.
	September 6	Conditional Statements <ul style="list-style-type: none">• Boolean expressions.• If/else statements

Week	Date	Topics
Week 4 Data Wrangling	September 9	<i>Iterations & for loops</i>
	September 11	<i>Creating Functions</i>
	September 13	<i>Creating Functions</i>
Week 4 Data Wrangling	September 16	<i>Creating Functions</i>
	September 18	<i>Introduction to tidyverse – reading & selecting</i> <ul style="list-style-type: none"> Importing data from an Excel file & from a package. Selecting columns – select()
	September 20	<i>Introduction to tidyverse - filtering</i> <ul style="list-style-type: none"> Filtering rows - filter()
Week 5 Data Wrangling	September 23	<i>Introduction to tidyverse - mutating</i> <ul style="list-style-type: none"> Mutating columns – mutate()
	September 25	<i>Introduction to tidyverse - summarizing</i> <ul style="list-style-type: none"> Summarizing data – group_by() & summarize()
	September 27	<i>Introduction to tidyverse – counting & arranging</i> <ul style="list-style-type: none"> Counting & arranging – count() & arrange()
Week 6 Data Wrangling Exam # 1	September 30	<i>Introduction to tidyverse – all functions</i> <ul style="list-style-type: none"> All functions combined
	October 2	Review for Exam # 1
	October 4	Exam # 1
Week 7 Joining Datasets	October 7	Mid-Semester Break – Classes do not meet
	October 9	<i>Joining Datasets - inner</i> <ul style="list-style-type: none"> What is joining datasets? Why is it important? inner_join()
	October 11	<i>Joining Datasets – left & right</i> <ul style="list-style-type: none"> left_join() right_join()
Week 8 Tidy Data	October 14	<i>Joining Datasets – full</i> <ul style="list-style-type: none"> full_join() joining by more than one column.
	October 16	<i>Tidy data</i> <ul style="list-style-type: none"> pivot wider pivot longer
	October 18	
Week 9 Data Visualization	October 21	<i>Plotting – ggplot()</i> <ul style="list-style-type: none"> one variable plots
	October 23	<i>Plotting – ggplot()</i> <ul style="list-style-type: none"> two variable plots
	October 25	<i>Plotting – ggplot()</i> <ul style="list-style-type: none"> cleaning, beautifying plots

Week	Date	Topics
Week 10 String & Dates	October 28	<p>Strings</p> <ul style="list-style-type: none"> • stringr
	October 30	<p>Dates</p> <ul style="list-style-type: none"> • lubridate
	November 1	<p>Maps</p> <ul style="list-style-type: none"> • Introduction to Map function • Nesting and iterating inside a dataframe
Week 11 Maps & Simulations	November 4	<p>Maps</p> <ul style="list-style-type: none"> • More on the family of map functions.
	November 6	<p>Simulations</p> <ul style="list-style-type: none"> • What is random sampling? • 1 trial theoretical probabilities
	November 8	
Week 12 Exam # 2	November 11	Review Exam # 2
	November 13	Exam # 2
	November 15	<p>Statistics</p> Introduction to Sampling Distributions & Bootstrapping
Week 13 Statistics & Interactive Data Visualization	November 18	<p>Statistics</p> Introduction to Sampling Distributions & Bootstrapping
	November 20	<p>Statistics</p> Introduction to Sampling Distributions & Bootstrapping
	November 22	Interactive Data Visualization
Week 14 Interactive Data Visualization	November 25	Interactive Data Visualization
	November 27	Thanksgiving Break – Classes do not meet
	November 29	
Week 15 Shiny	December 2	Interactive Data Visualization
	December 4	Shiny
	December 6 (Last day of Class)	Shiny
Week 16	December 9	Final Exam

Last Day to withdraw: November 1st

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