

Introduction to R for Data Science Syllabus

STAT 5730 Summer 2021

Course Information

- **Course times and location:** No required schedule meetings; all instruction occurs in Carmen each week
- **Credit hours:** 2
- **Mode of delivery:** Distance Learning

Instructor



- **Name:** Vincent Q. Vu
- **Email:** vu.104@osu.edu
- **Office location:** 428B Cockins Hall
- **Office hours:** Tuesdays and Thursdays from 9:30 a.m.–10:30 a.m.
- **Preferred means of communication:**
 - My preferred method of communication for questions is **email**.
 - My class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your [notification preferences](https://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Teaching Assistants

- **Name:** Juan Xie **Email:** xie.1097@osu.edu
- **Name:** Ruochen Zhao **Email:** zhao.3005@osu.edu

Course Prerequisites

Basic numeracy and familiarity with statistics is expected for motivation and perspective. No programming experience is required.

Course Description

R is a freely available statistical computing environment and programming language. It has become a dominant workhorse for modern statistical research and data analysis and is being widely adopted in industrial data analytics as well. The primary goal of the course is to teach students how to use R for data analysis: both (1) efficient use of the R computing environment and (2) effective programming in the R language.

Learning Outcomes

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

- Produce dynamic and reproducible reports with R Markdown
- Visualize various types of data in R using the ggplot2 package
- Import, manipulate and summarize data in R
- Use the R tidyr package to clean data prior to statistical analysis
- Write and execute R functions that involve iterations or conditional statements
- Work with special datatypes such as dates, times, and strings

How This Online Course Works

Mode of delivery: This course is 100% online. There are no required sessions when you must be logged in to Carmen at a scheduled time.

Pace of online activities: This course is divided into approximately **weekly modules** that are released at the beginning of the week. Students are expected to keep pace with weekly deadlines but may schedule their efforts freely within that time frame.

Credit hours and work expectations: This is a 2 credit-hour course. According to [Ohio State bylaws on instruction \(go.osu.edu/credithours\)](https://www.osu.edu/credithours), students should expect around 2 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 4 hours of homework (reading and assignment preparation, for example) to receive a grade of C average.

Attendance and participation requirements: Research shows regular participation is one of the highest predictors of success. With that in mind, I have the following expectations for everyone's participation:

- **Participating in online activities: at least once per week**
You are expected to log in to the course in Carmen every week. During most weeks you will probably log in many times. If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*.
- **Zoom meetings and office hours: optional**
My office hours are the only scheduled events for the course and are **optional**.
- **Participating in discussion forums: two or more times per week**
As part of your participation, each week you can expect to post at least twice as part of our substantive class discussion on the week's topics.

Course Materials, Fees and Technologies

Required Materials and/or Technologies

- [R4DS] Golemund and Wickham (2016): *R for Data Science*. Electronic version: <http://r4ds.had.co.nz>. This web version of the book can be accessed freely from any web browser.
- [HoPR] Golemund (2014): *Hands-On Programming with R*. Electronic version: <https://rstudio-education.github.io/hopr/>. This web version of the book can be accessed freely from any web browser.

Required Equipment

- **Computer:** current Mac (macOS) or PC (Windows or Linux) with high-speed internet connection, capable of running R and RStudio (described below)
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Required Software

R and RStudio: Students will be required to use R and RStudio software. RStudio can be downloaded for free at <https://www.rstudio.com/>. **Before installing RStudio, you must also download and install the base R software at <https://cloud.r-project.org/>.** You are expected to install R and RStudio on your personal computer by downloading the software from the links above. You will also have to install the packages **tidyverse** and **rmarkdown** in R. Further instructions will be provided during the lectures.

Grading and Faculty Response

How Your Grade is Calculated

Assignment Category	Percentage
Participation	10%
Homework	30%
Midterm Assessment	30%
Final Course Project	30%

See [Course Schedule](#) for due dates.

Assignment Information

Participation

You are expected to watch all lectures. The lectures will be delivered asynchronously and posted on the Carmen course webpage. In addition, there will be discussion boards on Carmen that you are **required** to contribute to regularly.

Homework

Homework will be assigned (approximately) weekly, will be due on announced dates and will be graded. Learning to compute and program requires practice. Homework assignments will mainly consist of exercises designed to reinforce the concepts covered in class during the previous week. You will be allowed to drop one homework score from your grade. I recommend completing all of the homeworks, even if you plan to drop one.

Midterm Assessment

A midterm assessment will take place approximately halfway through the course. Details will be announced on Carmen and during one of the lectures.

Final Project

Students will work individually on a final project involving the manipulation, exploration, and presentation of data. Details will be announced on Carmen and during one of the lectures.

Academic integrity and collaboration: Your written assignments, including discussion posts and code, should be your own original work.

Late Assignments

If you absolutely need to turn in an assignment late and have a valid excuse, please see me for the necessary arrangements. However, you must notify me in advance in such a situation. Exceptions to this policy will be permitted only in extreme situations such as serious injury immediately prior to an assignment being due or severe illness requiring hospitalization.

Grading Scale

93–100: A
 90–92.9: A-
 87–89.9: B+
 83–86.9: B
 80–82.9: B-
 77–79.9: C+
 73–76.9: C
 70–72.9: C-
 67–69.9: D+
 60–66.9: D
 Below 60: E

Instructor Feedback and Response Time

I am providing the following list to give you an idea of my intended availability throughout the course. Remember that you can call [614-688-4357 \(HELP\)](tel:614-688-4357) at any time if you have a technical problem.

- **Preferred contact method:** If you have a question, please contact me first through my Ohio State email address. I will reply to emails within **24 hours on days when class is in session at the university**.
- **Class announcements:** I will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check [your notification preferences](http://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Discussion board:** I will check and reply to messages in the discussion boards within **48 hours on days when class is in session at the university**.
- **Grading and feedback:** For weekly assignments, you can generally expect feedback and grades within **10 days**.

Discussion and Communication Guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online. I will provide specific guidance for discussions on controversial or personal topics.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Academic Integrity Policy

See [Descriptions of Major Course Assignments](#) for specific guidelines about collaboration and academic integrity in the context of this online class.

Ohio State's Academic Integrity Policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's [Code of Student Conduct](#) (studentconduct.osu.edu), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic

Misconduct. If COAM determines that you have violated the university's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- [Committee on Academic Misconduct](http://go.osu.edu/coam) (go.osu.edu/coam)
- [Ten Suggestions for Preserving Academic Integrity](http://go.osu.edu/ten-suggestions) (go.osu.edu/ten-suggestions)
- [Eight Cardinal Rules of Academic Integrity](http://go.osu.edu/cardinal-rules) (go.osu.edu/cardinal-rules)

Copyright for Instructional Materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at equity.osu.edu,
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

Your Mental Health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, [on-demand mental health resources](http://go.osu.edu/ccsondemand) (go.osu.edu/ccsondemand) are available. You can reach an on-call counselor when CCS is closed at [614- 292-5766](tel:614-292-5766). **24-hour emergency help** is available through the [National Suicide Prevention Lifeline website](http://suicidepreventionlifeline.org) (suicidepreventionlifeline.org) or by calling [1-800-273-8255\(TALK\)](tel:1-800-273-8255). [The Ohio State Wellness app](http://go.osu.edu/wellnessapp) (go.osu.edu/wellnessapp) is also a great resource.

Statement on Title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu



Accessibility Accommodations for Students with Disabilities

Requesting Accommodations

The university strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with [Student Life Disability Services \(SLDS\)](#). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services.

Disability Services Contact Information

- Phone: [614-292-3307](tel:614-292-3307)
- Website: slds.osu.edu
- Email: slds@osu.edu
- In person: [Baker Hall 098, 113 W. 12th Avenue](#)

Accessibility of Course Technology

This online course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations as early as possible.

- [CarmenCanvas accessibility](http://go.osu.edu/canvas-accessibility) (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- [CarmenZoom accessibility](http://go.osu.edu/zoom-accessibility) (go.osu.edu/zoom-accessibility)

Course Schedule (tentative)

Refer to the CarmenCanvas course site for up-to-date information.

Dates	Module	Topics, Readings, Assignments Due
5/12–5/14	1	Topic: Introduction to R, RStudio, and R Markdown Reading: R4DS 1.4–1.6, 4, 27.1–27.4.3
5/17–5/21	2	Topic: Data visualization with ggplot2 Reading: R4DS 3, 28 Due: Homework for Module 1
5/24–5/28	3	Topic: Data types and representation Reading: HoPR 1, 3–5 Due: Homework for Module 2
5/31–6/4	4	Topic: Data frames and data manipulation Reading: HoPR 3–4; R4DS 5.1–5.5, 10 Due: Homework for Module 3
6/7–6/11	5	Topic: Data summarization and pipes Reading: R4DS 5.6–5.7, 18 Due: Homework for Module 4
6/14–6/18	6	Topic: Date import and workflows Reading: R4DS 6–8, 11.1–11.2, 11.6 Due: Homework for Module 5
6/21–6/25		Midterm Assessment

Dates	Module	Topics, Readings, Assignments Due
6/28–7/2	7	Topic: Tidy data and relational data Reading: R4DS 12–13
7/5–7/9	8	Topic: Functions and conditional execution Reading: R4DS 19; HoPR 6–7 Due: Homework for Module 7
7/12–7/16	9	Topic: Dates and times Reading: R4DS 16 Due: Homework for Module 8
7/19–7/23	10	Topic: Iteration and functional programming Reading: R4DS 21, HoPR 9 Due: Homework for Module 9
7/26–7/30	11	Topic: Strings and factors Reading: R4DS 14–15 Due: Homework for Module 10
8/4		Due: Final Course Project