Programming for the Social Sciences
(POLS 60862)

Professor Erin Rossiter
erossite@nd.edu

Spring 2023

1 Course information

Location
Jenkins and Nanovic Hall B032

Time
Mondays 3:30pm-6:15pm

Office hours
Mondays 9:45am-noon
Mondays 6:15pm-7:00pm
(or by appointment)
2077 Jenkins Nanovic Halls

2 Description

Rapid increases in the availability of digitized social, economic, and political activities of people around the world, accompanied by advances in computational power and statistical methods needed to analyze it, have opened up new possibilities for social scientists. This course will prepare students to be active participants in this data-rich world by helping them understand core concepts behind the R programming language and gain practical programming skills. Specifically, students will learn how to collect, clean, manipulate, store, visualize, and share data using R. More importantly, because of how rapidly the landscape of statistical computing is changing, this course also aims to give students the foundational skills they need to teach themselves how to take advantage of new advances in this field throughout their careers.

3 Learning objectives

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

- Explain the basic components of the R working environment
- Understand object-oriented programming (or at least R's version of this)
- Understand the basic control functions, flow functions, and data structures of R
- Functionalize complex and/or repetitive code
- Clearly document software during and after development
- Debug and analyze your code for speed
- Read-in and write-out data and text of any format, including information collected online
- Create custom data visualizations
- Create a simple R package capable of passing the CRAN checks

- Document and test an R package for general distribution
- Use more advanced tools for data management (e.g., relational data) and visualization provided in the `tidyverse`

A note for undergraduates

I am always excited to welcome interested undergraduates into the class. Moreover, undergraduates will be graded more leniently and with lower expectations than the graduate students. However, please note that this class is primarily aimed at the needs of graduate students in the department of political science. This means that the pace will be much faster, the workload much harder, and the level of organization and guidance much lower than you would expect from a standard undergraduate class.

4 Required Materials

Below are the required texts. I like *R for Dummies*, but you do not have to buy it. All other books are available online.

- de Vries, Andrie and Joris Meys. 2015. *R for Dummies* (2nd Edition). Wiley.
- Wickham, Hadley. 2019. *Advanced R*. (2nd Edition) CRC Press. https://adv-r.hadley.nz/
- Wickham, Hadley. 2015. *R Packages*. https://r-pkgs.org/
- Wickham, Hadley and Garrett Grolemund. 2017. *R for Data Science*. OReilly. https://r4ds.had.co.nz/
- Dirk Eddelbuettel. 2013. *Seamless R and C++ Integration with Rcpp*. Springer. (Don't buy – check SpringerLink through library)
- Wickham, Hadley, Mastering Shiny. OReilly. https://mastering-shiny.org/

5 Prerequisites

This is an advanced R programing course and thus assumes a working knowledge of R. Students need to have taken Intro to Quantitative Methods or receive permission from me.

6 Course Auditing

No auditing of this course is permitted. All participants must register and take the course for a grade. I will not consider exceptions to this policy.

7 Grading Scale

A	[93-100]%
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/I	[0-60)%

See the registrar's explanation of letter grades. There will not be opportunities for extra credit.

8 Grade Components

Problem Sets (30%), lowest 2 dropped

Problem sets, or homeworks, will be distributed throughout the course. *Unless otherwise specified*, these are individual assignments that you should prepare yourself, though you may ask your colleagues for help. To be clear, *every single keystroke for these assignments should be your own.* Please turn them in at the on the specified date and time via a (timestamped) Github commit.

Problem sets will be distributed on Tuesday afternoons by 4pm EST to give time to adjust the content to how the course session goes and due the following Tuesday afternoon at 4pm EST.

Each student's lowest two homework grades will be dropped in the final grade calculations. This option should be reserved for illness, family emergencies, broken alarm clocks, or other unforeseen events. No additional waivers will be granted.

Midterm Exam (20%)

You will complete a take-home exam where you will be expected to write code independently to accomplish a specific task. Specifics will be explained at the time of the exam.

Final Project and Presentation (30%)

Each student will complete a final project and present it to the class. The final project can take many forms: it could be related to the students' ongoing original research, it could be related to RA work for another faculty member, or it could be learning the functionality of an R package. Students will discuss project plans with me for approval early in the semester.

Participation & in-class work (20%)

Students are expected to actively engage in class discussion and in-class activites. The participation grade includes attending class, visiting professor office hours, completing the readings, and being an overall good citizen in the course.

Note: I reserve the right to curve any and all grades.

9 Re-Grading Policy

In the case where a student would like to appeal a grade, they must submit a written appeal via email within 72 hours of the graded homework or exam being redistributed. I will not consider any other forms of re-grading requests (i.e., those made in office hours) or any requests that occur beyond 72 hours.

10 Email, Slack, Github, and Canvas

Email and Slack

Slack will be where we communicate about this course. If you email a question, I will just ask if it is okay to post on Slack instead. I will usually respond to emails/Slack messages within 24 hours, except for weekends and university holidays. I ask that you double check that any question sent via email/Slack can not be answered by the syllabus. If you expect your question requires more than a short paragraph response, please come to office hours or make an appointment with me to discuss. I may ask you to come to office hours to discuss if I deem the email requires more than a short paragraph response.

I expect that you check Slack once a day or announcements.

Github

All course content will be posted on Github, and you will submit all assignments via Github.

Canvas

Canvas will only be used for grading purposes.

11 Academic Integrity

I expect that students take academic integrity seriously. Instances of cheating, plagiarism, or other forms of academic dishonesty will be reported. All students are responsible for familiarizing themselves with the Honor Code on the University's website and pledge to observe its provisions in all work.

We will review what does and does not consitute plagarism in class. In particular, for this class, students should keep academic integrity in mind for problems sets and exams.

For problem sets, you **will** be allowed to work in groups. However, each person must turn in their own problem set and their own code. My guiding principal for joint work is that *each key stroke should be your own.* Moreover, students should take great care to attribute others' writing and code to the original source. For example, if you found a solution or explanation to a problem set question on Stack Overflow (this is totally fine!), include a URL in the code explaining what portion came from the online source.

For exams, you **will not** be allowed to work in groups. The exam is open-book, open-note, open-Internet, but you cannot consult classmates or anyone else (like family or other grad students) about solutions.

The following guidelines apply the above discussion on academic integrity to the use of ChatGPT specifically:

- Use it on any problem set question unless I explicitly say not to.
- Indicate in writing exactly what part of the answer chatGPT gave, including if it was the entire thing.
- Each keystroke must be your own as it says on the syllabus. This is not a metaphor. Each literal keystroke must be your own. (If I find evidence of copy/paste, the PSet grade will be a 0.)
- Finally, I trust that if chatGPT gives an answer, you'll dig into it to make sure you see why/how the code is working.

12 Privacy Practices

This course is a community built on trust. In order to create the most effective learning experience, our interactions, discussions, and course activities must remain private and free from external intrusion. As members of this course community, we have obligations to each other to preserve privacy through the following practices:

- Course materials (videos, assignments, readings, etc.) are for use in this course only. You may not upload them to external sites, share with students outside of this course, or post them for public commentary without my written permission.
- In our discussions, some of us may volunteer sensitive personal information. Do not share others' personal information on sensitive topics outside of our course community. Student work, discussion posts, and all other forms of student information related to this course are private.
- If we must transition to Zoom at some point, I plan to record class meetings. These recordings will be available for review through Canvas. I ask that the only recordings made of our class meetings are the ones I am making on Zoom for educational purposes.

13 Statement on Inclusiveness

I expect that students are committed to and strive to maintain a positive learning environment based on open communication, mutual respect, and non-discrimination. In this class we will not discriminate on the basis of race, gender, age, economic class, disability, veteran status, religion, sexual orientation, color, or national origin. Any suggestions as to how to further such a positive and open environment will be appreciated and given serious consideration.

14 Title IX: Confidentiality and Responsible Employee Statement

Notre Dame faculty are committed to helping create a safe and open learning environment for all students. If you (or someone you know) have experienced any form of sexual misconduct, including sexual assault, dating or domestic violence, or stalking, know that help and support are available.

I am available to discuss concerns. Please know that information shared with me regarding alleged sexual assault, sexual misconduct, dating violence, domestic violence, stalking, or conduct that creates a hostile environment will be reported to the University's Title IX Coordinator or Deputy Title IX Coordinator to investigate as I am a mandatory reporter.

If you wish to speak to a confidential employee who does not have this reporting responsibility, you can contact counseling, medical, or pastoral resources. Please see the Title IX website for more information, including phone numbers and hotlines, about reporting options and resources at Notre Dame and in the community.

15 Statement on Covid-19

I will alert you to any possible changes in course requirements, including course format changes, in response to Notre Dame's decisions about community safety during the semester.

Additionally, I may ask students to wear masks. Please always have one with you for class and office hours.

Students will not be penalized for having to self-quarantine or self-isolate given Covid-19. Course materials and assignments will be available for completion in an alternative modality if needed.

16 Mental Health Statement

Diminished mental health, including significant stress, mood changes, excessive worry, or problems with eating and/or sleeping can interfere with optimal academic performance. The source of symptoms might be strictly related to your course work; if so, please speak with me. However, non-academic parts of life, like problems with relationships, family worries, loss, or a personal struggle or crisis, can also contribute to decreased academic performance.

Notre Dame provides mental health services to support the academic success of students. In the event I suspect you need additional support, I will express my concerns and the reasons for them, and remind you of resources that might be helpful to you. It is not my intention to know the details of what might be bothering you, but simply to let you know I am concerned and that help, if needed, is available.

The University Counseling Center (UCC) provides cost-free and confidential mental health services to help you manage personal challenges that threaten your emotional or academic well-being.

Remember, getting help is a smart and courageous thing to do — for yourself and for those who care about you. For more resources please see ucc.nd.edu or care.nd.edu.

The UCC is located on the third floor of Saint Liam Hall
Hours: Monday-Friday 8:30am - 5:00pm
Urgent Crisis Line 24/7: 574-631-7336

17 Accommodations for Disabled Students

Notre Dame supports the rights of enrolled students to a full and equal educational opportunity and, in compliance with federal, state, and local requirements, and is committed to reasonable accommodations for individuals with documented disabilities.

Students for whom accommodations may be necessary must be registered with, and provide their instructors official notification, through Sara Bea Accessibility Services. I work with students and Sara Bea Accessibility Services to ensure that students with documented disabilities have the resources that they need to be successful.

Please speak with me as soon as possible regarding accommodations. Students who are not registered should contact the Office of Disability Services as soon as possible since accommodation typically needs to be arranged well in advance.

18 Religious and Cultural Observance Accommodations

Student with a conflict between an academic requirement and a religious or cultural observance should notify me within the first three weeks of class of the specific dates in order to schedule a make-up activity. I strongly encourage

you to honor your religious holidays and cultural practices! However, if I do not hear from you within the first three weeks of class, I will assume you plan to attend all class meetings and can participate in all activities.

19 Syllabus Change Policy

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.

20 Schedule

Unit 1 – R

Week 1: 1/23 – Introductions & Basics of R

Week 2: 1/30 – Advanced R Part 1

- Problem set 1 due

Week 3: 2/6 – Advanced R Part 2

- Problem set 2 due

Unit 2 – Collecting data

Week 4: 2/13 – Webscraping and HTML Part 1

- Final project approval due
- Problem set 3 due

Week 5: 2/20 – Webscraping and HTML Part 2

- Problem set 4 due

Week 6: 2/27 – Working with APIs

- Problem set 5 due

Unit 3 – Data cleaning and management

Week 7: 3/6 – Data cleaning

- Midterm Exam

Midterm break

Week 8: 3/20 – Data wrangling

- Problem set 6 due

Week 9: 3/27 – Creating an R Package (subject to change)

- Final project update due
- Problem set 7 due

Unit 4 – Advanced Topics

Week 10: 4/3 – Data visualization

- Problem set 8 due

Easter holiday

Week 11: 4/17 – Relational data (subject to change)

- Problem set 9 due

Week 12: 4/24 – Interfacing with other languages (subject to change)

- Problem set 10 due

Week 13: 5/1 – Present final projects

- Projects due May 10 at 5pm EST