

# Introduction to the R Statistical Environment

ICPSR Summer Program

18 July, 2022- 4 August, 2023

Instructor: Sarah Hunter  
Office: Newberry  
Office Hours:

Course materials: **Course Canvas**  
Class Hours:

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## Course Description

This is a class designed to introduce you to the basics of the R statistical Environment. This is a free, open-source statistical program used by many fields in academia and in industry. R is flexible and has a wide range of uses.

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

- Understand the workflow in R using R Studio
- Know the basic structure and logic of the R programming language
- Perform data management with R
- Calculate and interpret descriptive statistics in R
- Use data visualization tools such as base plot and ggplot
- Be familiar with the tidyverse suite of tools for data management and data visualization
- Perform simple linear regression in R
- Understand simple programming in R

## Texts

While there is no required texts for this course, there are some highly recommended texts to further your knowledge on using R. Below are some examples:

- Harris, Jenine K. 2020. *Statistics with R: Solving Problems Using Real-World Data*. Los Angeles: Sage.

- Wickham, Hadley. and Garrett Golemund. 2017. *R for Data Science: Visualize, Model, Transform, Tidy, and Import Data*. O'Reilly Media, Inc. [FREE at <https://r4ds.had.co.nz/index.html>]
- Fox, John, and Sanford Weisberg. 2018. *An R Companion to Applied Regression, 3rd Edition*. SAGE.

## Software

In this course, we will be learning to work in R through R Studio IDE (interactive development Environment). You will need to download R and R Studio separately. You can get both for free. If you are having trouble downloading the software for any reason, you can also use R Studio through the cloud. If do choose this option, please talk to me about some of the differences between using the Cloud and the downloaded software. You can find the links needed below.

- R: <https://cran.r-project.org>
- R Studio <https://posit.co/downloads/>
- R Studio Cloud: <https://posit.cloud>

## Communication

You can always reach me through my official University of Michigan email account or through Canvas as needed. Class time is also the perfect time to ask questions

## Office Hours

Office hours are the times that I have set aside for any of you to stop by to ask questions. I will have in-person and online office hours simultaneously. Feel free to use either modality you prefer.

## Grades

There are no formal grades or assignments for this class. There will be optional Lab Assignments for you to complete in your own time. I will also post solutions for you to check your answers.

## Course Schedule

### Day 1: Introduction

*Introduction, downloading the program, getting started in R*

#### Topics:

- Introduction to the Course

- Downloading the program
- Taking a tour of R
- Workflow and replicability

**Reading:**

- Harris pp. 1-30
- W&G Chapters 1, 6

**Day 2: Data Manipulation I****Topics:**

- Types of data
- Loading data into R
- Recoding and cleaning data
- Working with packages

**Reading:**

- Harris Ch. 1
- W & G Ch. 11

**Day 3: Data Manipulation II****Topics:**

- Transforming data
- Reshaping, recoding, and aggregating data

**Reading:****Day 4: Data Manipulation III****Topics:**

- Data manipulation with the tidyverse

**Reading:**

- H& G Ch. 12-13

**Day 6: Descriptive Statistics****Topics:**

- The moments of a distribution
- Bivariate statistics

**Reading:**

- Harris Ch. 2

**Day 7: Lab Day**

**Topics:**

- Review
- Practice

**Reading:**

- None

**Day 8: Data Visualization I**

**Topics:**

- Base Plot in R

**Reading:**

- Harris Ch. 2

**Day 9: Data Visualization II**

**Topics:**

- ggplot

**Reading:**

- Harris ch. 3
- W & G Ch. 3, 7

**Day 10: Lab Day**

**Topics:**

- Review
- Practive

**Reading:**

- None

**Day 11: Debugging 101**

**Topics:**

- Common errors in code

- Where to find help

**Reading:**

- [R Bloggers](#)

**Day 12: Linear Models in R**

**Topics:**

- OLS estimation
- GLM estimation
- Model Presentation

**Reading:**

- Harris Ch. 9, 10, 11

**Day 13: Simple Programming**

**Topics:**

- Using loops and functions
- Where to go from here

**Reading:**

- W & G Ch. 17-21

**Day 14: The Basics of R Markdown**

**Topics:**

- Getting Started with R Markdown files

**Reading:**

- TBA