R for Public Policy (PUBPOL 477/577) – Fall 2019
MW 1:00PM-2:30PM

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Office Hours: TBD (and appointments at bit.ly/ABHW-OO)
Syllabus Version: 2.0 (30 August 2019)

Overview and Goals:

This course is designed to familiarize students with core skills in the programming language R. Students will learn about the fundamentals of R, data import, entry, and manipulation. They will also learn basic analysis techniques for public policy analysis, including basic statistical tests, regression analysis (of linear and non-linear models), basics of robust errors and mixed effects models, and exploratory visualization. Students will also learn how to use "packages" - the core building blocks of R's functionality and flexibility - and RStudio, a commonly used IDE for programming in R. The expectation for this course is that students gain basic familiarity with how R works, understand how to use R to perform basic analysis, and learn how to find resources (packages, help, support) to expand their use of R in their own work. This course is designed for students with no prior experience programming in R.

Text(s):

Although there are no mandatory readings for this course, I'm happy to recommend textbooks and resources for deeper study in R. As R is open source, there are a variety of freely-available resources for you to review. I am also happy to recommend printed texts if you are so inclined. There will also be a repository of helpful links/tutorials posted to the Canvas site.

Software:

This course is taught in R, an open-source and free programming language, using the RStudio IDE (integrated development environment), which is also available free of charge to students. Instructions for obtaining the software for use on personal computers will be posted to Canvas. This software is also available in lab, on AppsAnywhere, or via Virtual Sites for student use. If you are having difficulty obtaining software, you are encouraged to contact the instructor as soon as possible.

Course assessments:

Assignments in the course are graded on completion. My expectation is that you will make a good faith effort to complete the assignments and will note where you had difficulties if you were unable to complete the tasks. (This is to help me help you with the methods.) Each submitted task should be accompanied by notes if you were unable to complete a task. Most of the submissions will involve submitting a summary document and R code. This is a lab course on technical skills and is graded pass/fail (credit/no credit, satisfactory/unsatisfactory) overall. Failure to complete tasks will be a basis for a "no credit" or "unsatisfactory" grade.

Assignment Schedule:

- Task 1 (Object Types and Data Import) – Sept 11 – Sept 18
- Task 2 (Transforming Data and Function Creation) – Sept 18 – Sept 25
- Task 3 (Summaries and Exploration of Data) – Sept 25 – Oct 2
- Task 4 (Basic Visualization and Basic Regression) – Oct 2 – Oct 9
- Task 5 (More Regression Analysis) – Oct 9 – Oct 16
- Final Task (Example Project) – Oct 16 – Oct 23, 5PM EST

A note on attendance: This class is dense and is organized around lab time. Your attendance is expected. Of course, there are a variety of reasons why one might miss class. (The university has policies around religious observance and the like, but many more may arise for which no policy exists.) If you expect to be unable to attend class, please let me know via email. If you consistently miss class, we will need to have a conversation about your participation in the course. To aid my (ABHW's) memory, attendance will be taken in session.

Additional Matters:

Accommodations - This course is meant to give you the skills you need when you leave the Ford School and go out into a career. If you are having difficulty with how the material is presented, or need additional help getting something to "stick" in your mind, please let me know. I want this course to be a positive one for everyone. If you believe you need an accommodation for a disability, please let your instructor know at your earliest convenience. Some aspects of courses may be modified to facilitate your participation and progress. As soon as you make your instructor aware of your needs, they can work with the Services for Students with Disabilities (SSD) office to help determine appropriate academic accommodations. Any information you provide will be treated as private and confidential.

Communication - I try to reply to emails within 24 hours. Over holidays, this may run a bit longer. If your email is a simple one, I'll get to it all in one go. If you ask something more in-depth, or have a more complex request, it may take more time. I'll still try to touch base within 24 hours so you know I'm working on it. Please make requests or notify me of absences as early as possible.

Student Mental Health and Well-Being Resources - The University of Michigan is committed to advancing the mental health and wellbeing of its students. We acknowledge that a variety of issues, such as strained relationships, increased anxiety, alcohol/drug problems, and depression, directly impacts students' academic performance. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) and/or University Health Service (UHS). For a listing of other mental health resources available on and off campus, visit: http://umich.edu/~mhealth/

On Inclusivity - Members of the Ford School community represent a rich variety of backgrounds and perspectives. We are committed to providing an atmosphere for learning that respects diversity. While working together to build this community we ask all members to:

- share their unique experiences, values and beliefs
- be open to the views of others
- honor the uniqueness of their colleagues

- appreciate the opportunity that we have to learn from each other in this community
- value one another's opinions and communicate in a respectful manner
- keep confidential discussions that the community has of a personal (or professional) nature
- use this opportunity together to discuss ways in which we can create an inclusive environment in Ford classes and across the UM community

A more comprehensive list of expectations, policies, and resources is on the Ford School website. (http://fordschool.umich.edu/academics/expectations) Please take particular note of the policies on academic dishonesty.

A Final Note - This course calendar was created as a guide but may change. Because of some interactions of breaks and half-term course scheduling, we have only 12 sessions, so we must make the most of it. It is very possible that we, as a group, may find ourselves moving more quickly through material than planned. It is also possible that we may need to take more time to nail down details of certain topics/tasks. If the schedule changes significantly to reflect our progress, a new syllabus (with an updated version number - see above) will be distributed.

Class/Topic Schedule:

Session 1 – September 4 – Welcome and "Hello World" In R
- Obtaining Software
- Using RStudio
- Hello World in R
- Introducing packages

Session 2 – September 9 – Basics 1 - Understanding Object Oriented Programming
- Object types in R
- Atomic elements, vectors, matrices, and more
- Understanding assignment

Session 3 – September 11 – Basics 2 – Getting Data into R
- Importing data
- Creating data
- Organizing your data

Session 4 – September 16 – Basics 3 – Merging, Manipulating, and Transforming Data
- Merges and Joins
- Variable Creation and Transformation
- From Wide to Long (and back)

Session 5 – September 18 – Basics 4 – Functions and Programming
- How Functions Work
- If/Then/Else Statements
- Creating Functions

- The “apply” functions

Session 6 – September 23 – Analysis 1 – Summaries in R
- Univariate Summaries
- Summaries with grouping and filtering
- Variable Comparisons

Session 7 – September 25 – Analysis 2 – Statistical Tests in R
- Tests of difference in Variance
- Tests of difference in mean
- Correlation

Session 8 – September 30 – Analysis 3 – Exploratory Visualization in R
- Why we look at our data
- Intro to ggplot
- Exploratory univariate visualizations in R
- Exploratory multivariate visualizations in R

Session 9 – October 2 – Analysis 4 – Basics of Regression Analysis
- Linear Regression “by hand”
- Linear Regression using LM functions
- Predicted Values

Session 10 – October 7 – Analysis 5 – Non-linear Regression in R and Robust Errors
- Logit and Probit models in R
- Robust and Clustered Errors in R

Session 11 – October 9 – Analysis 6 – Panel Models and Output
- PLM functions, Fixed and Random Effects
- Getting results out of R for publication

NO CLASS – October 14 (STUDY BREAK)

Session 12 – October 16 – Wrapping up and Further Study
- Final Task Distributed
- Where to go next

FINAL TASK DUE – October 23, 5PM EST