

Policy Analytics Credential Program (PAC) Sample Syllabus (2024)

Course Description

The Policy Analytics Credential Program is a dynamic program designed to equip individuals with essential skills in programming and statistics with a policy lens. Led by the vibrant Harris School of Public Policy community members, the program presents an open and inviting learning experience with a group of UChicago alumni and current graduate students who excel in coding and are enthusiastic about empowering more learners to bridge data skills with policy practice.

Foundations of Programming in R is designed to lay a strong foundation for studying data analysis using the powerful statistical modeling software, R. It will familiarize students with essential aspects of R, including data manipulation, causal inference techniques, data visualization, and more. The aim is to empower students to apply R effectively in their future professional endeavors or graduate studies. The course begins with the fundamentals, making it an ideal choice for those new to the field.

Foundations of Statistics It provides students with an understanding of the concepts of statistical inference and a familiarity with the methods of applied statistical analysis. It exposes students to fundamental statistical principles, such as probability, descriptive and inferential statistics, correlation, regression, and more. Ultimately, students will develop the capability to interpret data from a scientific perspective and apply these methods effectively in real-world scenarios.

Policy Insights & Data Exploration Workshops are thoughtfully structured to guide students through data analysis, with the dedicated support of Harris experienced graduate instructors. These sessions also act as relevant check-in points where theoretical knowledge meets hands-on coding, emphasizing real-world data analytics challenges. An excellent opportunity for students to solidify their coding and statistical knowledge through practice.

Virtual Format

Academic lectures for Foundations of Programming in R and Foundations of Statistics are delivered via weekly video modules (pre-recorded lectures). These modules will provide students with the knowledge and materials to understand the basics of statistics and build practical programming skills.

Live office hours are held multiple times throughout each week, enabling students to connect with graduate teaching assistants. For 6 out of the 9 weeks, students have the opportunity to participate in live Policy Insights & Data Exploration Workshops, led by graduate instructors. The schedule and how to access the virtual sessions will be available on the Canvas calendar.

Course Materials

All necessary course materials will be made accessible via Canvas. There are no required textbooks.

Assignments and Grading

The assignments for this course will consist of homework assignments. Each homework assignment will be released via Canvas, and you will submit your homework in Canvas by the required deadline.

Communication

Communication from instructors and TAs to students will happen through posting of materials on Canvas, including postings to Announcements and on Ed Discussion.

The most effective way for the teaching team to support students is for student to submit questions in the following forms:

- Questions regarding course material should be asked in the live Office Hours or posted on Ed Discussion, a forum that is monitored by the teaching assistants and instructors.
- Questions regarding scheduling should be directed to the Head TA.

Ed Discussion Board: This course will also have a dedicated Ed Discussion board. Ed Discussion is a free online gathering place where students can engage with each other regarding course material, under the guidance of their instructors. Setting up an ed discussion account will be part of your first assignment, but participation is optional. On Ed Discussion, you can both ask and answer questions related to homework assignments and course materials. If you provide a strong answer, one of the teaching assistants might endorse your answer.

R Resources

In week 1, you will download R and RStudio. Please use the following resources to do so.

Download R: [here](#).

Download R Studio: [here](#)

Guide for Downloading R: [here](#)

Schedule

	Content
Week 1	Introduction to Programming in R This week is the kickoff for our journey into R. Students will be familiarized with what R is and its paramount importance in the data analytics world. We delve into the RStudio environment, acquainting students with its layout and functionalities. By the end of the week, students should be comfortable with basic R syntax, including variable declarations, data types, and primary operations.

<p>Week 2</p>	<p>Data Transformation in R - Part I & First Workshop</p> <p>This week, students will explore data frames in-depth, understanding their creation, structure, and manipulation. They will be introduced to tidyverse. They will also learn the basics to relational data in R, highlighting join techniques. Data transformation is the backbone of any data analytics task, and mastering these skills ensures that students can cleanse and prepare data effectively for any analytical challenge. At the end of this week, students will have the opportunity to meet with a graduate instructor and participate in the first workshop, where they will have the chance to apply what they have learned so far, work collaboratively, and showcase their problem-solving capabilities.</p>
<p>Week 3</p>	<p>Data Transformation in R - Part II & Second Workshop</p> <p>To master data manipulation! The week starts by diving into tidying data using the tidy package from tidyverse and related tools, ensuring that data is in a suitable structure for analysis. Furthermore, we touch on how to format and handle string, date, and time data types. At the week's close, students will have their second workshop.</p>
<p>Week 4</p>	<p>Data Visualization with ggplot2</p> <p>Data visualization is an art and a vital skill for anyone in data analytics. This week, students will be exposed to the basics of the Grammar of Graphics from the ggplot2 package, the layered approach to building plots. As they move forward, they will delve deeper into customizing their visualizations through faceting and theming, empowering them to tell compelling stories through their data.</p>
<p>Week 5</p>	<p>R Programming Concepts & Introduction to Statistics & Third Workshop</p> <p>The week begins with a focus on control flow statements and loops in R, allowing for more complex programming logic. As we transition to statistics, students will get an overview of what statistics entails and its significance before delving into data types and sampling techniques. Approaching the end of this week, students will engage in a live session with a graduate instructor.</p>
<p>Week 6</p>	<p>Probability & Foundations of Statistics & Fourth Workshop</p> <p>This week, we focus on the bedrock concepts that underpin much of statistics: probability. Students will grasp the basics of probability, explore random variables, and get acquainted with probability distributions like binomial, Poisson, and normal distribution. The week concludes with an</p>

	<p>understanding of sampling distributions. Mastering these topics is critical to advanced statistical concepts and analyses in subsequent weeks. The week culminates in a workshop.</p>
Week 7	<p>Descriptive and Inferential Statistics</p> <p>Now, students will learn how we can describe datasets effectively and make informed decisions based on data samples. We will start with descriptive statistics, exploring central tendency and dispersion measures. Students will be exposed to estimation techniques, hypothesis testing, and interpreting p-values and significance levels as we transition to inferential statistics. These skills are fundamental for any data analyst aiming to make data-driven decisions.</p>
Week 8	<p>Correlation and Regression & Fifth Workshop</p> <p>This week is all about relationships. Students will explore correlation, understanding how variables relate to one another. They will then dive into regression, starting with simple linear regression before tackling multiple predictors in multiple linear regression. We will also address the assumptions behind these models and delve into diagnostics. Understanding these relationships is critical to predicting outcomes and crafting data-driven policies. The week ends with the synchronous workshop.</p>
Week 9	<p>Causal Inference, Experiments, and the Grand Finale Coding</p> <p>The week unfolds with a riveting exploration of causal inference as students traverse the intricate labyrinth of why correlation does not equate to causation. Students are introduced to Rubin's Causal Model and potential outcomes, painting a holistic tableau of causal effects and treatment impacts. This provides the groundwork for diving into the art and science of experimental design, empowering students to sculpt practical, data-driven experiments. Finally, students will combine their cumulative knowledge at the Grand Finale Coding, tackling a final dataset. This summit is not just a test – it is a celebration of their growth, of their new community, and of the skills they now come to master.</p>

Credential Award

Upon successful completion of the coursework, you will be issued a Certification of Credential Completion, by the University of Chicago Harris School of Public Policy. The Certification of Credential Completion contains a point grade for each academic component: Foundations of Programming in R and Foundations of Statistics. You will receive an email from our office (harriscredential@uchicago.edu) with the electronic certification of completion approximately four weeks after the program.