Overview
This course explores the most popular class of statistical methods used for causal inference in the social sciences. Working within the potential outcomes framework, we discuss how the logic of inference for randomized experiments is the same as for non-randomized (observational) studies under certain additional assumptions. Though randomized experiments serve as the gold standard for causal inference, we note how it may sometimes be reasonable to treat non-experimental data as if it had been drawn from an experiment. Usually, this involves some knowledge about how the natural world produced the data through a quasi-random process. Research designs and methods covered include randomized experiments, matching, instrumental variables, difference-in-differences, synthetic control, and regression discontinuity designs. In turn, we discuss how all of these methods require a unique set of assumptions to allow us to make valid causal inferences. Throughout the course we will draw examples from across the social sciences to illustrate the vast range of applications of these methods. Furthermore, the course will include computing sessions during which students are taught how to implement the techniques using modern statistical software.

Meeting Time and Place
Thursdays, 19:00 - 21:50
Room 4402, Main Academic Building, Lifts 17-18
Intended Learning Outcomes

At the end of the course, students should be able to:

1. Understand the history and development of the experimental method across the social sciences.
2. Understand the history and development of quasi-experimental research designs across the social sciences.
3. Understand the history and development of the potential outcomes framework.
4. Identify and understand the major identification assumptions and data structures required for credible causal inference in modern applied social science statistics.
5. Conduct and interpret statistical analyses of data from social science research designs using experimental and quasi-experimental designs.
6. Apply their knowledge of how to conduct and interpret statistical analyses to original social science problems.

Grading

10% Fundamentals Problem Set
Students will complete one homework assignment consisting of questions about the potential outcomes framework. Responding to these questions will involve some basic mathematics, understanding of philosophical issues regarding causality in the potential outcomes framework, and interpretation of statistical results. Students are encouraged to use any class notes and books or supplemental materials that they find useful, and to work with other students in the class. However, each student must submit an individual assignment. Though cooperation and use of notes and books is encouraged, students must put answers into their own words and plagiarism will not be tolerated. [ILOs 1, 2, 3, and 4]

– Distributed on February 8 after class, due by midnight on February 23

10% Individual Presentation in Experiment Workshop
We will hold a two-day workshop during the semester focused on applied social science journal articles that use experimental methods. During the workshop, students will give individual presentations focused on a summary and critique of an article of their choosing in consultation with the instructor. A detailed description of the assignment, as well as a schedule for the presentations, will be provided in class and on Canvas. [ILOs 4 and 5]

– Presentations will occur during class on April 11

50% Computing Problem Sets
Throughout the semester, students will complete a series of structured problem sets primarily focused on performing statistical analysis using R and accompanied written interpretation of statistical results. For each problem set, students will be provided with a dataset and a series of tasks to perform. Answers should be submitted in pdf format, with the computer code used to produce the results included (rendered R Markdown documents with the computer code embedded inline in the document are welcome, but not required). Examples of similar analyses will be covered during the lectures. Students are encouraged to use any class notes, readings, or supplemental materials that they find useful, and to work with other students in the class. However, each student must submit an individual assignment.
Though cooperation and use of notes and books is encouraged, students must put answers into their own words and plagiarism will not be tolerated. Note: When calculating final grades on Computing Problem Sets for SOSC4250 students, the lowest score will be dropped; for SOSC6030R students, all scores will be counted. [ILOs 4, 5, and 6]

- Computing Problem Set 1: Experiments
  * Distributed on February 15 after class, due by midnight on February 26
- Computing Problem Set 2: Instrumental Variables
  * Distributed on February 22 after class, due by midnight on March 1
- Computing Problem Set 3: Matching and Weighting
  * Distributed on March 7 after class, due by midnight on March 15
- Computing Problem Set 4: Regression Discontinuity Designs
  * Distributed on March 21 after class, due by midnight on April 8
- Computing Problem Set 5: Difference in Differences
  * Distributed on April 18 after class, due by midnight on April 26

20% Final Paper

In a paper (of about 3000 words for SOSC4250 and about 5000 words for SOSC6030R students), students will conduct an original data analysis on a topic of their choosing and write up the results in the style of a research note journal article. Student topics should be chosen in consultation with the instructor. A detailed description of the assignment will be provided in class and on Canvas. [ILOs 4, 5, and 6]

- Topics should be finalized in consultation with the instructor by April 19
- Papers are due by midnight on May 26

10% Attendance

After the Add/Drop period, attendance will count toward students’ final grade. Students can miss two class sessions for any reason without penalty. Any additional absences will be penalized unless they are valid excuses backed up by documentation.

Readings

Required readings should be completed prior to the date they are listed on the schedule. All readings will be provided through Canvas. There is no text that is perfect for this course, and therefore there is no text that students are required to purchase. However, the following books are highly recommended, particularly if students wish to dive deeper into the topics covered in this course or pursue them in their own research.

Schedule

Schedule is subject to change with advanced notice from the instructor. If any changes are made to the schedule or readings, said changes will be announced in class and an updated version of the syllabus posted to Canvas.

Thursday, February 1

- **Topic:** History of experimental research; development and evolution of the experimental method in various social science disciplines; introduction and overview of quasi-experiments
  - Required Readings:
- **Topic:** Introduction to the Potential Outcomes Framework
  - Required Readings:
  - Recommended Readings:
Thursday, February 8

• Topic: Placing Experiments in the Potential Outcomes Framework
  – Required Readings:

• Topic: Internal and External Validity
  – Required Readings:

• Topic: Ethical Considerations in Social Science Experiments
  – Required Readings:
  – Recommended Readings:


Thursday, February 15

• Topic: Extending Experiments
  – Required Readings:
  – Recommended Readings:

• Topic: Statistical Analysis of Experiments
  – Required Readings:
    * None

Thursday, February 22

• Topic: Instrumental Variables Analysis
  – Required Readings:

• Topic: Statistical Analysis Within the Instrumental Variables Framework
  – Required Readings:
    * None
      – Recommended Readings:
Required Readings:


Recommended Readings:


Thursday, March 7

- **Topic: Statistical Analysis Using Matching and Weighting**
  - Required Readings:
    * None

Thursday, March 14

- **Topic: Regression Discontinuity Designs**
  - Required Readings:
  - Recommended Readings:


Thursday, March 21

- **Topic:** Statistical Analysis of Regression Discontinuity Designs
  - Required Readings:
Thursday, April 11

- **Topic:** Experiments Workshop
  - Required Readings:
    * No additional readings beyond your group’s presentation article
  - Assessment:
    * In class: Group presentation of experimental article

Thursday, April 18

- **Topic:** Difference in Differences
  - Required Readings:
  - Recommended Readings:

- **Topic:** Statistical Analysis of Difference in Differences
  - Required Readings:
* None

- **Recommended Readings:**
  


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**Thursday, April 25**

- **Topic: The Synthetic Control Method**
  
  - **Required Readings:**
    


- **Topic: Statistical Analysis of Synthetic Control Designs**
  
  - **Required Readings:**
    
    * None

  - **Recommended Readings:**
    


Thursday, May 2

- **Topic: Frontiers in Experimental and Quasi-Experimental Research in the Social Sciences**
  - Required Readings:
    - TBD

Thursday, May 9

- **Topic: Course Overview and Wrap-Up**
  - Required Readings:
    - None