

Instructor: EunYi Chung
Office: 210 David Kinley Hall (DKH)
Office Hours: M 12:20PM-1:20PM (In-person)
T 11:15AM-12:15PM (Zoom)
or by appointment
Contact: eunyi@illinois.edu
Grader: TBD

Schedule: MW 9:30AM-10:50AM
138 Wohlers Hall

ECON590: Casual Inference and Policy Evaluation

Fall 2024

Course Description

The goal of this course is to develop the basic tools necessary to understand and use modern econometric methods. The course will focus on how one goes about estimating and making inferences for causal effects by paying special attention to empirical cases dealing with policy-relevant issues. Topics that will be covered throughout the semester include, but are not limited to randomized experiments, observational studies, matching methods, differences-in-differences, synthetic control, regression discontinuity design, instrumental variables, and local average treatment effects. We discuss the theoretical aspects of various methods and examine how they are applied in the literature.

Course Notes

- *Number of Credits:* 4
- *Pre-Requisites:* ECON 502 and ECON 305 are strongly recommended as prerequisites for this course. If you have not mastered the material covered in those courses, you may find this course rather difficult. It is assumed that all students have knowledge in calculus, linear algebra, and basic statistics and econometrics. In particular, students should be familiar with basic multivariate calculus (first and second derivatives and how to obtain them), matrices and matrix operations, basic properties of random variables, calculating expectations, variances, correlations, conditional expectations and conditional variances, and multiple linear regressions. Although we will review some material, it will be brief. Thus, if you do not have sufficient mathematical and statistical background and preparation, you may struggle with the materials covered in this course and should consider taking this course after strengthening these skills.
- *Frequency & Duration:* MW 9:30AM-10:50AM

Course Goals

By the end of the course, students will have...

- developed the basic tools necessary to understand and use modern econometric methods
- understood identification and inference of each method covered in class

- fostered an ability to read, comprehend, and analyze scholarly works on theoretical and empirical econometrics
- learned to use the statistical software package called R to conduct your own empirical research
- advanced your empirical research dealing with treatment effects
- learned to engage with contemporary issues based on the theoretical, empirical, and analytical tools covered in this course
- strengthened your presentation and writing skills while working in a group

Required Materials

Supplemental: There will be no "required" textbook for this class. All the relevant materials including lecture notes and problem sets will be available on Canvas (<http://canvas.illinois.edu>). Other material will be distributed in class.

The recommended textbooks for this course are:

- "Mastering 'Metrics: The Path from Cause to Effect," by J. Angrist and S. Pischke (2014).
- "Mostly Harmless Econometrics," by J. Angrist and S. Pischke (2008).
- "Trustworthy Online Controlled Experiments: A Practical Guide to A/B Testing," by R. Kohavi, D. Tang, and Y. Xu (2020).
- "Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction," by D. Rubin and G. Imbens (2015).
- "Design of Observational Studies," by P. Rosenbaum (2010). You can download the e-version from link.springer.com/book/10.1007/978-1-4419-1213-8/page/1.

You will learn how to use the statistical software package called **R**, which will be used in class and for your problem sets. Students are welcome to use other statistical packages, but the solutions for the problem sets will be provided using **R**. Please download R (<http://ftp.ussg.iu.edu/CRAN/>) and RStudio (rstudio.com).

Although you will learn to use R in this course, if you are interested in learning more outside of the class, here are some free tutorials. All three cover similar materials:

- The R Guide by Owen: <http://cran.r-project.org/doc/contrib/Owen-TheRGuide.pdf>
- An Introduction to R by Venables and Ripley: <http://cran.r-project.org/doc/manuals/R-intro.pdf>
- Simple R by Verzani: <http://cran.r-project.org/doc/contrib/Verzani-SimpleR.pdf>

Course Requirements

Scoring

	4 credits
6 Assignments	150 Total Points
2 Midterms	300 Total Points
Final Exam	250 Total Points
Group Presentation and Project	300 Total Points
Individual Presentation	Extra Credit
Total	1000

Your grade will be calculated as a percentage based on the scoring above. The final grade for the class will be out of 1,000 points. Note that the lowest assignment score will be dropped. To calculate your grade before all exams and assignments are finalized, divide the total points you have scored in the course by the total points. Multiply that number by 100 and round to the nearest integer; then compare that number to the Plus/Minus Grade Cutoffs below.

Grading Scale

A+	100-97.00	C+	77.00-79.99	F	0-59.99
A	93.00-96.99	C	73.00-76.99		
A-	90.00-92.99	C-	70.00-72.99		
B+	87.00-89.99	D+	67.00-69.99		
B	83.00-86.99	D	63.00-66.99		
B-	80.00-82.99	D-	60.00-62.99		

Assessment Policies

Assignment Policy:

All assignments are to be turned through Canvas. Late assignments receive *no* credit. You are encouraged to work as a group with your classmates although you have to hand in your own solutions. The assignment portion of your grade will be the average of all your assignment scores after dropping one lowest assignment.

Exam Policy:

In the event that a student misses one of the exams, the instructor reserves the right to give the student a zero on that exam. There are no make-up exams.

Important Dates:

Problem Set Dues:

- Problem Set1: Wednesday September 4th
- Problem Set2: Wednesday September 11th
- Problem Set3: Wednesday September 18th
- Problem Set4: Wednesday October 9th
- Problem Set5: Wednesday October 16th
- Problem Set6: Wednesday November 13th

Exam Schedule:

EXAM I: Monday September 23rd, in class

EXAM II: Wednesday October 2^{3rd}, in class

Final Exam: Wednesday November 20th, in class

Final Project Paper Due: Monday December 16th 11AM CT

Exam dates and times are *not* flexible. The only exception to this rule is a death in the family or illness requiring immediate attention from a physician. See Article 1 - Student Rights And Responsibilities (for more details on these issues at:

http://www.admin.illinois.edu/policy/Code/article1_part5_1-501.html

Final Project:

The goal of conducting a final project is to learn how to develop a research paper using the econometric techniques we learned in class. This will require you to think critically and consider how to develop a research idea into an actual project. At the end of the semester, you will present your project in class and submit your group paper. You can work as a group no larger than 3 individuals - More details later.

Presentation:

For those who want extra credits, you will present a paper that is related to a topic/ econometric method covered in class. You may choose a paper on your own based on your interest (and get a confirmation with me) or I can assign you a paper of your interest – More details later.

Student Learning Objectives

As a preeminent public land grant university, the University of Illinois at Urbana-Champaign serves society and transforms lives, producing leaders who value excellence, innovation, inclusivity, stewardship, and accountability. Through a uniquely Illinois experience that takes place both inside and outside the classroom, our graduates are broadly educated yet have expertise in specific fields of study. They are intellectually curious, having the ability to think critically and imaginatively. They exhibit a consciousness of global connectedness and interdependencies, possess a critical appreciation of social and cultural communities, and participate knowledgeably and responsibly in civic life. Ultimately, our graduates understand how to employ knowledge in order to generate new ideas, discoveries, and solutions, and are adept in building and sustaining productive relationships in order to create positive change.

The course will foster the following SLOs during the semester: (1) intellectual reasoning and knowledge to acquire broad and deep knowledge across academic disciplines and fields, (2) creative inquiry and discovery to promote inquiry, discover solutions, and generate new ideas and creative works, (4) social awareness and cultural understanding to develop a critical and reflective orientation toward such social and cultural differences as race, indigeneity, gender, class, sexuality, language, and disability, and (5) global consciousness to discover how complex, interdependent global systems natural, environmental, social, cultural, economic, and political – affect and are affected by the local identities and ethical choices of individuals and institutions.

Academic Integrity

According to the Student Code, 'It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions.' Please know that it is my responsibility as an instructor to uphold the academic integrity policy of the University, which can be found here: http://studentcode.illinois.edu/article1_part4_1-401.html

Assignment Policies:

All assignments are to be turned in using Canvas. Late assignments receive *no* credit. You are encouraged to work as a group with your classmates, but you have to hand in your own solutions. The assignment portion of your grade will be the average of the five highest assignment scores (lowest score will be dropped).

For the final group project, your group is required to submit a proposal, a midterm update, and a final paper. You will also be required to give an in-class presentation at the end of the semester.

Exam Absences

Please refer to the university's study code regarding class attendance found here: <https://studentcode.illinois.edu/article1/part5/1-501/>. As noted in the provided link, the authority to excuse absences rests with the course instructor. Make up exams are not permitted and are only made in cases of rare emergencies. Emergencies which warrant an absence letter include, but are not limited to prolonged illnesses or injury of 3 days or more, life threatening or serious illness or injury or death of an immediate family member, a student's religious beliefs, observances, and practices, etc.

If you deem that your circumstances constitute an emergency and you are unable to attend class to take a scheduled exam, you must immediately contact the Student Assistance Center in the Office of the Dean of Students to request an absence letter. This letter should be accompanied by supporting evidence, such as a supplementary absence letter by relevant parties (e.g. family doctor, university official, etc), detailing the reason why you are unable to attend class and take the exam. For prolonged illnesses, formal documentation by a health care provider who provided treatment to the student must be submitted on the provider's letterhead. Minor illnesses will not be a justifiable excuse to miss a scheduled exam. Notes from McKinley or CampusTown Urgent Care are not considered medical excuses and will not be accepted.

Students with chronic health conditions and/or disabilities that may affect their class attendance should register with Disability Resources and Educational Services (DRES), in accordance with § 1-110.

Final Exam Conflict Policy

From the University's final exam policy:

- Any student having more than two consecutive final examinations is entitled to reschedule if he or she takes the following actions no later than the last day of class:
 - The student must investigate whether a conflict examination is being held at another time for any of the examinations involved.
 - If a conflict examination has been scheduled for any of the courses, the student must take one or more of these conflict examinations. If conflict examinations are offered for more than one course, the student must take the conflict for the course that has the largest number of students.
 - If no conflict examinations have been scheduled, the student must contact the instructor of the course with the largest number of students. The contact must be made by the last day of classes, and that instructor must provide a makeup.
 - Normally in a semester several combined-sections, conflict, and non-combined examinations are given at the same time. As a guide to resolving conflicts, an order of priority has been established within each examination period, and a student should resolve a conflict using the published examination schedules and the following priority guidelines.
 - National and state professional examinations (e.g., CPA, actuarial science, Architecture Registration Examination) take priority over campus final examinations. An instructor must offer a conflict examination to a student scheduled to take a national or state professional examination and a campus final examination at the same time.
 - A non-combined course examination has precedence over any combined-sections or conflict examination.
 - A department offering a combined-sections final examination must provide a conflict examination if required to accommodate student conflicts.

The University's final exam policy is available at:
http://studentcode.illinois.edu/article3_part2_3-201.html

Student Assistance

For personal issues, contact the Counseling Center by calling (217)333-3704. More information is available at <http://www.counselingcenter.illinois.edu/>. In addition, the Counseling Center provides study skills resources. See <http://www.counselingcenter.illinois.edu/outreach-consultation/first-generation-students/studying-time-management-writing-skills/> for more information. If you feel you need help with your writing skills, contact the Writers Workshop at the Center for Writing Studies by calling (217)333-8796. You can find additional information online at <http://www.cws.illinois.edu/workshop/>.

Students with Disabilities

The Division of Disability Resources and Educational Services (DRES) has been designated by the University as the primary office to guide, counsel, and assist students with disabilities. DRES works to provide a variety of academic accommodations and support services to allow students equal access to their courses and campus activities. DRES and the student will discuss the interaction between the disability and the academic environment in order to determine necessary academic adjustments and modifications. If you already receive service through DRES and require accommodations for this class, make an appointment with me as soon as possible to discuss your approved accommodation needs. Please bring your accommodation letter with you. I will hold any information you share with me in the strictest confidence. If you have not contacted DRES and need accommodations (note-taking assistance, extended exam times, etc), DRES will require appropriate documentation. Please visit <https://www.disability.illinois.edu> or reach them at (217)333-4603.

Emergency Response Recommendations

The Department of Homeland Security and the University of Illinois at Urbana-Champaign Office of Campus Emergency Planning recommend the following three responses to any emergency on campus: RUN > HIDE > FIGHT. Only follow these actions if safe to do so. When in doubt, follow your instincts – you are your own best advocate. The university maintains guidelines for emergency responses.

Please the following links:

<http://police.illinois.edu/emergency/response/>

http://illinois.edu/cms/2251/general_emergency_response_recommendations_8_16_13_final.doc
[x](#)

Floor plans are available at <http://police.illinois.edu/emergencyplanning/floorplans/>

COURSE SCHEDULE
(tentative)

WEEK	DATE	DUE	TITLE
1	AUG 26 AUG 28		<i>Class Introduction: Causal Inference Rubin's Causal Model & Basic Statistics</i>
2	SEP 2 SEP 4	Problem Set I	<i>No Class (Labor Day) Randomized Experiments & OLS</i>
3	SEP 9 SEP 11	Problem Set II	<i>Programming: R1 Regression Method</i>
4	SEP 16 SEP 18	Problem Set III	<i>Programming: R2 Fisher's randomization Test</i>
5	SEP 23 SEP 25		EXAM I (SEP 23) <i>Power</i>
6	SEP 30 OCT 2	Proposal	<i>Observational Studies Matching</i>
7	OCT 7 OCT 9	Problem Set IV	<i>Programming: R3 Propensity Score</i>
8	OCT 14 OCT 16	Problem Set V	<i>Programming: R4 Difference-in-differences</i>
9	OCT 21 OCT 23		<i>Synthetic Control EXAM II (OCT 23)</i>
10	OCT 28 OCT 30	Individual Group Meetings	<i>Group Project</i>
11	NOV 4 NOV 6	Updated Proposal	<i>Regression Discontinuity Design Instrumental Variables</i>
12	NOV 11 NOV 13	Problem Set VI	<i>Local Average Treatment Effects I Local Average Treatment Effects II</i>
13	NOV 18 NOV 20		<i>Practice Final Final (NOV 20)</i>
14	NOV 25 NOV 27		<i>No class (Thanksgiving break)</i>
15	DEC 2 DEC 4		<i>Student Presentations I Student Presentations II</i>
16	DEC 9 DEC 11		<i>Student Presentations III Student Presentations IV</i>
17	DEC 16		* Final Research Paper DUE * 11:00AM