

## UNDERGRADUATE CAUSAL INFERENCE AND RESEARCH DESIGN: SYLLABUS

Course code: Economics 4341

Term: Spring 2014

Location: Cashion 408

Time: 12:30 - 1:45, Tues/Thurs

Website: [http://business.baylor.edu/scott\\_cunningham/Causal\\_inference.html](http://business.baylor.edu/scott_cunningham/Causal_inference.html)

Instructor: Prof. Scott Cunningham  
Department of Economics  
Baylor University

Text: 254-537-2239

Email: [scunning@gmail.com](mailto:scunning@gmail.com)

Office: Hankamer 365

Office hours: Wed/Fri: 9:30-11:00AM or by appointment

### COURSE DESCRIPTION

The objective of this course is to equip students with the core empirical tools used in modern social sciences for identifying causal effects. Students will learn the classical experimental design, the importance of random selection and assignment, and why random assignment is rarely feasible in most social scientific applications of interest. Students will gain a foundational understanding of the “potential outcomes” model associated with Roland Fisher and Donald Rubin, as well as the causal graphical models developed by Judea Pearl. The majority of the class will focus on selection bias and treatment assignment.

This is a very hands-on course, and the primary pedagogy used will emphasize example and replication. Examples of research topics will be drawn from diverse topics in economics, education, health and criminal justice. Such topics will include the study of the effect of job trainings programs on employment and wages, schooling, the operations of specialized fish markets, cigarette smoking and taxes, and other topics as time permits.

Students should have some familiarity with statistics, and would benefit from having taken econometrics. Students will also implement a number of research strategies using the statistical software Stata. Having experience with Stata is not a requirement, since we will learn how to use it as part of the course.

### COURSE OBJECTIVES

The primary objective of this course is for students to understand the difficulty in inferring causality in social scientific research. Complementary course objectives consist of:

- implementing a variety of econometric tools and research strategies for causal inference, and
- developing programming skills (in the statistical software package Stata)

### COURSE OUTCOMES

Course objectives are measures via the course assignments which assess acquired substantive knowledge and analytical ability via written work. See below under “Coursework, Grades, and Grading Policies”.

### CREDIT

Students will be evaluated based on two midterms, several problem sets including a few empirical projects using statistical software, STATA.

## TEXTBOOKS

The required texts are:

Morgan, Stephen L. and Christopher Winship. 2007. Counterfactuals and Causal Inference: Methods and Principles for Social Research. Cambridge University Press.

You can purchase it online here:

[http://www.amazon.com/Counterfactuals-Causal-Inference-Principles-Analytical/dp/0521671930/ref=sr\\_1\\_1?ie=UTF8&qid=1345516215&sr=8-1/](http://www.amazon.com/Counterfactuals-Causal-Inference-Principles-Analytical/dp/0521671930/ref=sr_1_1?ie=UTF8&qid=1345516215&sr=8-1/)

and:

Angrist, Joshua and Jrn-Steffen Pischke, 2008. Mostly Harmless Econometrics: An Empiricist's Companion Princeton University Press, 1st edition.

You can purchase it online here:

<http://www.amazon.com/Mostly-Harmless-Econometrics-Empiricists-Companion/dp/0691120358>

All other readings are available online, either through a link to an electronic journal or through library e-reserve. Links will be distributed to students via the instructor's course website as the semester progresses. Some of the readings are technical pieces from economics journals. The degree to which a student needs to be familiar with the details of a paper will be clear from the emphasis given to the paper in lecture.

## COURSEWORK, GRADES, AND GRADING POLICIES

Final course grades will be based on the following breakdown:

- Midterm 1 (35%)
- Midterm 2 (35%)
- Problem sets (30%)

## EXAMS (70%)

The exams may cover any material from the assigned readings in the text, as well as any additional material that I cover in lecture. Students will be excused from the midterm exams only for valid medical or family emergencies. These excuses must be identified before the midterm and students must produce signed evidence verifying the reason why they cannot attend. If it is missed for a valid reason, weight will be reassigned from the other exams; otherwise, zero credit will be given.

Students may ask that an exam be re-graded if they feel that a mistake has been made, by giving me a request in writing explaining their reasoning. The entire exam will be regraded and, after re-reading the exam, the grade may rise or fall. Of course, if a simple mistake has been made in adding up points, students should bring this to my attention and the grade will be changed.

The first exam is scheduled for **TBA**. The final exam is **TBA**. The final exam will cover material from the entire semester. No makeup final exams will be allowed. If you will not be available during this time, please enroll in another course.

## PROBLEM SETS (30%)

This is a very hands-on course, and students will be required to learn STATA, an econometric package available for purchase. A student version is available through STATA Gradplan for \$65, or students can use the version installed in the computer labs. Please contact me if you are interested in purchasing a Stata DVD for yourself and I will arrange it. Stata Corp. has a list of excellent web-based tutorials for learning how to use Stata:

- <http://www.stata.com/links/resources1.html>

## **CLASS PARTICIPATION**

If you miss more than 7 classes, Baylor policy requires that I fail you. In addition to being physically present, I expect students to come to class mentally prepared.

## **ACADEMIC HONESTY**

All students must be familiar with and abide by Baylor's Code of Academic Conduct, which is available online at <http://www.baylor.edu/honorcode/index.php?id=44060>. I take matters of academic honesty very seriously. A student who commits academic dishonesty disrespects the hard work of his classmates. Any student found cheating, plagiarizing, or colluding during the course will be referred to the Associate Dean. If you fall behind in your coursework and even feel tempted to be dishonest, please see me first so that we find a way for you to turn in your work late (but with some penalty). That said, students are encouraged to study together and to collaborate on homework, although each student must write up her own homework.

## **TENTATIVE SCHEDULE AND TOPICS**

The following is a rough outline of the topics we will cover in class:

- Potential outcomes model, directed acyclic graphical modeling, statistics review
- Selection on observables: back-door criterion
- Selection on observables: stratification, propensity score matching, covariate matching
- Selection on observables: ordinary least squares
- Selection on unobservables: partial identification, bounded estimates of ATE, Manski
- Selection on unobservables: instrumental variables, heterogeneous treatment effects, LATE
- Selection on unobservables: front-door criterion, mechanisms
- Selection on unobservables: panel methods, differences-in-differences, triple differences, synthetic control
- Selection on unobservables: regression discontinuity design
- Other topics (remainder)