



## **A A E 737: APPLIED ECONOMETRIC ANALYSIS III**

**Credits:** 3

**Canvas Course URL:** <https://canvas.wisc.edu/courses/219201>

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Meeting Time and Location:**

Tuesdays and Thursdays, 11:00 a.m. – 12:15 p.m., 1125 Nancy Nicholas Hall (School of Human Ecology)

**Instructional Mode:** face-to-face only

**How Credit Hours are Met by the Course:**

This class meets for two, 75-minute class periods each week over the spring semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc.) for about 3 hours out of the classroom for every class period. This syllabus includes more information about meeting times and expectations for student work.

### **INSTRUCTOR**

**Instructor:** Dr. Andrew W. Stevens, Assistant Professor, Agricultural and Applied Economics

**Instructor Availability:**

Office hours will be conducted remotely due to COVID-19. Please email me to request a meeting.

**Instructor Email:** [awstevens@wisc.edu](mailto:awstevens@wisc.edu) (Please include “AAE 737” in your email subject line.)

### **OFFICIAL COURSE DESCRIPTION**

**Course Description:**

Prepares students for their own empirical work by examining contemporary econometric techniques as they are used in development, environment and natural resources, and agricultural economics. Guides students through a selection of applied models using past and current research as examples. By hearing lectures and working through papers, problem sets, replication exercises, and/or research projects, students will develop a deeper understanding of the many facets of empirical research in economics.

**Requisites:**

ECON 709 and ECON 710

(If you have not taken these or comparable courses, please speak with me early in the semester.)

**Course Narrative:**

*Correlation is not causation. In this course we will explore different empirical techniques that can separate causal effects from mere correlations. In other words, this course is about **causal inference**. I have designed this course for PhD-level students in quantitative social science disciplines who have a solid background in statistics, linear algebra, and econometric theory. We will connect theory to empirical*

applications with the ultimate goal of you being able to employ the techniques discussed in this course in your own original research. Depending on your background and objectives, this may or may not be the most appropriate course for you. Other similar options at UW–Madison include ECON 706 (Econometrics III) and PS 813 (Multi-variable statistical inference for political research).

## LEARNING MANAGEMENT SYSTEM

This course utilizes Canvas for many learning management functions including hosting some lecture recordings, some in-class activities, assignment submissions, and more. The link to this course's Canvas site is: <https://canvas.wisc.edu/courses/219201>. Students should explore and become familiar with Canvas and its functionalities.

## LEARNING OUTCOMES

By the end of this course, you will be able to:

- explain and assess the concepts of causal inference and identification in the design-based paradigm of econometric analysis
- articulate the necessary assumptions underpinning various applied identification strategies
- assess and critique specific applications of the identification strategies discussed in this course
- conduct and interpret econometric analyses applying various identification strategies using statistical software
- summarize ongoing debates about the validity of empirical research in economics including issues of internal validity, external validity, and replicability

## GRADING

- Grade components
  - Problem sets: 50% (5 at 10% each)
  - Reading quizzes: 10% (I will drop your lowest score)
  - Final exam: 40%
- Grade calculation
  - I reserve the right to curve the following grading scale in students' favor at the end of the semester. However, I do not expect to do this.
  - Please note that this grading scale is somewhat atypical:
    - A: >90
    - AB: 80-90
    - B: 70-80
    - BC: 60-70
    - C: 50-60
    - D: 40-50
    - F: <40

## REQUIRED TEXTBOOK, SOFTWARE & OTHER COURSE MATERIALS

There is one required textbook for this course:

- [AP] Angrist, J. D. & Pischke, J. S. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.

Another excellent reference for this course (probably more useful than any of the textbooks listed below) is Guido Imbens' set of notes from an NBER Summer Course in 2007 called "What's New in Econometrics." The notes are available for free online at <http://nber.org/WNE/WNEnotes.pdf>.

All other readings will be accessible through the University library or provided by me. However, I also encourage you to have at least one good reference econometrics textbook. The three listed below are all good options, and I am particularly fond of the Cameron & Trivedi and Wooldridge texts.

- [CT] Cameron, A. C. & Trivedi, P. (2005). *Microeconometrics: Methods and Applications*. Cambridge University Press
- Greene, W. H. (2017). *Econometric Analysis (8th Edition)*. Pearson.
- [W] Wooldridge, J. (2002). *Econometric Analysis of Cross Section and Panel Data*. MIT Press.

You will need access to Stata in order to complete the problem sets. Stata is available to you for free through the Campus Software Library. (If you would prefer to use another statistical software such as R, SAS, or SPSS, please speak to me early in the semester.)

## EXAMS, QUIZZES, PAPERS & OTHER MAJOR GRADED WORK

- Final exam
  - There will be a cumulative take-home final exam for this course. I will provide specific instructions near the end of the semester.
  - You will have at least forty-eight (48) hours to complete the exam. Exams submitted late will receive a score of zero. Technical difficulties are not acceptable reasons to receive an exception to this policy.

## HOMEWORK & OTHER ASSIGNMENTS

- Problem sets
  - There are five (5) problem sets in this course. You will have at least a week to complete each problem set.
  - You may work individually or with up to two additional people on your problem sets. If you work with others, you must list your collaborators and each of you must submit your own write-up of answers. When coding is required, you must also submit your code.
  - In general, problem sets will not be accepted late. Each student may submit **one** problem set up to one class period late without penalty. Otherwise, the assignment will receive a zero. If there are extenuating circumstances, please contact me as soon as possible and we can discuss your individual situation.
- Reading quizzes
  - Throughout the semester, I will give short in-class quizzes on certain readings. In all cases, I will give you at least two days advanced notice that there will be a reading quiz.
  - I will drop your lowest reading quiz score. If you miss a reading quiz without communicating with me, you will receive a zero.

## COURSE SCHEDULE

(I reserve the right to make adjustments if needed.)

### I. COURSE PRELIMINARIES

- Th – Sept 3: Course introduction and overview
- Tu – Sept 8: Model-based vs. design-based approaches to causality (David Card lecture)
- Th – Sept 10: Ordinary least squares (OLS)
  - AP Ch. 3.1
  - CT Ch. 4.1-4.5
  - W Ch. 2
- Tu – Sept 15: The Rubin causal model
  - AP Ch. 1-2
  - CT Ch. 2

- Th – Sept 17: Randomized control trials
  - **Problem set 1 distributed**

## II. SELECTION ON OBSERVABLES

- Tu – Sept 22: Regression adjustment
  - AP Ch. 3.2
  - CT Ch. 4.1-4.5
  - W Ch. 4, 18.3.1
- Th – Sept 24: Nonparametric regression I
  - **Problem set 1 DUE**
- Tu – Sept 29: Nonparametric regression II
- Th – Oct 1: Matching methods
  - AP Ch. 3.3
  - CT Ch. 25.4
  - W Ch. 18.3.2
- Tu – Oct 6: Propensity score methods
- Th – Oct 8: Additional selection-on-observable methods
  - **Problem set 2 distributed**

## III. SELECTION ON UNOBSERVABLES

- Tu – Oct 13: Random effects
  - AP Ch. 5.1-5.2
  - CT Ch. 21, 22
  - W Ch. 10
- Th – Oct 15: Fixed effects, the within estimator, and differencing
  - **Problem set 2 DUE**
- Tu – Oct 20: Differences in differences and triple-differences
- Th – Oct 22: Synthetic controls
  - CT Ch. 25.5
  - **Problem set 3 distributed**
- Tu – Oct 27: Instrumental variables I
  - AP Ch. 4.1-4.3
  - CT Ch. 4.8
  - W Ch. 5
- Th – Oct 29: Instrumental variables II
  - AP Ch. 4.6
  - CT Ch. 4.9
  - **Problem set 3 DUE**
- Tu – Nov 3: Regression discontinuities I
  - AP Ch. 6
  - CT Ch. 25.6
- Th – Nov 5: Regression discontinuities II
- Tu – Nov 10: Bandwidth issues
- Th – Nov 12: TBA
  - **Problem set 4 distributed**

## IV. STATISTICAL INFERENCE AND OTHER TOPICS

- Tu – Nov 17: Clustering standard errors
  - AP Ch. 8.2
  - CT Ch. 24.5
- Th – Nov 19: Randomization Inference
  - **Problem set 4 DUE**
- Tu – Nov 24: Bootstrapping
  - CT Ch. 11

- Th – Nov 26: THANKSGIVING BREAK – NO CLASS
- Tu – Dec 1: Machine learning techniques
  - **Problem set 5 distributed**
- Th – Dec 3: Pre-analysis plans and registration
- Tu – Dec 8: Replication
  - **Problem set 5 DUE**
- Th – Dec 10: TBA
- Tu – Dec 15: FINALS WEEK – NO CLASS
  - **Final exam distributed**
- Th – Dec 17: FINALS WEEK – NO CLASS
  - **Final exam DUE**

## USE OF RECORDED LECTURES AND OTHER COURSE CONTENT

Lecture materials and recordings for AAE 737 are protected intellectual property at UW–Madison. Course materials and recordings are available exclusively for students' personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. Students may not copy or have lecture materials and recordings outside of class outside the official course Canvas site, including posting on internet sites or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

## UW-MADISON FACE COVERING GUIDELINES

While on campus all employees and students are required to wear appropriate and properly fitting face coverings while present in any campus building unless working alone in a laboratory or office space.

### Face Coverings During In-person Instruction (COVID-19)

Individuals are expected to wear a face covering while inside any university building. Face coverings must be worn correctly (i.e., covering both your mouth and nose) in the building if you are attending class in person. If any student is unable to wear a face-covering, an accommodation may be provided due to disability, medical condition, or other legitimate reason.

Students with disabilities or medical conditions who are unable to wear a face covering should contact the McBurney Disability Resource Center or their Access Consultant if they are already affiliated. Students requesting an accommodation unrelated to disability or medical condition, should contact the Dean of Students Office.

Students who choose not to wear a face covering may not attend in-person classes, unless they are approved for an accommodation or exemption. All other students not wearing a face covering will be asked to put one on or leave the classroom. Students who refuse to wear face coverings appropriately or adhere to other stated requirements will be reported to the Office of Student Conduct and Community Standards and will not be allowed to return to the classroom until they agree to comply with the face covering policy. An instructor may cancel or suspend a course in-person meeting if a person is in the classroom without an approved face covering in position over their nose and mouth and refuses to immediately comply.

## **QUARANTINE OR ISOLATION DUE TO COVID-19**

Students should continually monitor themselves for COVID-19 symptoms and get tested for the virus if they have symptoms or have been in close contact with someone with COVID-19. This course is designed in such a way that you should be able to continue your participation in this course even if you are quarantined. However, you should also reach out to me as soon as possible if you become ill or need to isolate or quarantine so we can ensure there is a plan for how to proceed with the course.

## **COURSE EVALUATIONS**

UW–Madison now uses an online course evaluation survey tool, AEFIS. You should receive an official email two weeks prior to the end of the semester when your course evaluation is available. You will receive a link to log into the course evaluation with your NetID where you can complete the evaluation and submit it, anonymously. Your participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.

## **ACADEMIC CALENDAR & RELIGIOUS OBSERVANCES**

Please refer to the official UW–Madison academic calendar for important deadlines including the last day to drop courses or withdraw without notation on your transcript, the last day to drop courses with full tuition refund, the last day to drop courses, and the last day to apply for a pass/fail grade or convert your enrollment from for-credit to audit: <https://secfac.wisc.edu/academic-calendar/>

Wisconsin law mandates that any student with a conflict between an academic requirement and any religious observance must be given an alternative for meeting the academic requirement. If you wish to request relief from any aspect of this course for a religious observance, please notify me via email within the first two weeks of class and specify the specific days or dates for which you are requesting relief. We will work together to determine an appropriate way to satisfy the affected course requirements in an appropriate way.

## **ACADEMIC INTEGRITY**

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but are not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

## **ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES**

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Providing reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform me of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. I will work either directly with you or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

## **DIVERSITY & INCLUSION**

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.