

**Introductory Econometrics  
Econ 410 (4 Credits), Spring 2023  
University of Wisconsin-Madison**

**Instructor**

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**Teaching Assistants**

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**Instructional Mode**

In-Person Classroom Instruction

**Course Overview**

The purpose of this course is to provide an introduction to econometrics – the statistical methods that economists use to evaluate empirical relationships and test economic theory. Attention will be given both to econometric theory and to the problems that arise when applying econometric techniques to real world data. We begin with an extended discussion of univariate and multivariate regression analysis. Later in the semester, we tackle more advanced topics, such as instrumental variables, limited dependent variable models, and the application of regression models to time series and panel data.

Note: Our department offers two introductory econometrics courses: Econ 400 and Econ 410. Econ 400 places less emphasis on theory and a correspondingly greater emphasis on applied techniques. Econ 410 takes a more mathematical & theoretical approach, deriving formulas and proving results wherever possible. Econ 400 and 410 are not a sequence. Students take only one of the two. Students doing our math emphasis major, including all those pursuing honors in the major, must take Econ 410.

**Prerequisites**

The prerequisites for this class are Econ 310 and Math 221.

**Class Meetings and Office Hours**

Lecture is **Tuesdays and Thursdays** from **2:30 to 3:45pm** in **Social Sciences 5106**.

My office hours are **Wednesdays** from **9:00 to 10:30am** in Social Science 7321. Your TA will announce his or her office hours at your first discussion section.

## **Required Course Materials**

As noted in the Course Guide, this course uses an **Engage eText**, which is available via our course webpage (see below). Our textbook is: Introductory Econometrics: A Modern Approach by Jeffrey M Wooldridge, Seventh Edition. There is no need to purchase the textbook from the publisher, since the cost of the eText is already bundled into your tuition bill. For more information, including opt-out instructions, see the Engage eText [Frequently Asked Questions](#).

This course requires frequent use of a **computer** (Mac or Windows) with **Stata** installed. Because UW-Madison has a site-license, Stata can be downloaded for free from the Campus Software Library. You will also need a **calculator** and access to a **reliable internet connection**.

## **Course Webpage**

Lecture notes and all other course materials will be posted on our course website: <https://canvas.wisc.edu/courses/331058>

## **Evaluation**

Your overall grade for the course will be based on the following components:

- Midterm Exams: There will be two midterms, each worth 22% of your overall grade. Midterms will be held **in-person** during our regularly scheduled lecture on **March 2** and **April 13**. **Ensure you are available these dates**. If you are unable to take an exam due to a circumstance that is beyond your control, let me know and we will discuss how best to proceed. To qualify for an accommodation, the circumstance must make it impossible for you to complete the midterm at the scheduled time, it must be fully documented, and you must notify me in advance of the midterm.
- Final Exam: The (cumulative) final for this class is worth 22% of your overall grade and will be held during our official final exam block on **Monday May 8** from **7:45am to 9:45am**.
- Problem sets: There will be five problem sets, which together are worth 34% of your grade – so completing them will be critical to your success. **For full credit, problem sets must be submitted (either in-class or under my office door) by 3:45 p.m. on the day they are due**. Late problem sets may be submitted (under my office door) up to 24 hours after this deadline, but will receive a 20% deduction. After that point, late problem sets will no longer be accepted. Do not submit problem sets in my mailbox or to your TA, as these have a tendency to get lost in the shuffle.

The computer package Stata will be used extensively on the problem sets. To help prepare you for these assignments, Stata will be used during lectures and tutorials will also be provided during discussion section. **For those problem sets that use Stata, to receive full credit, you must submit a Stata log electronically via Can-**

**vas.** You are encouraged to form a study group with your classmates, but you must **write up your answers independently** (meaning that you should not be looking at another student's answers as you write up your own). **Problem sets with identical answers will not be accepted (i.e., receive zero credit).**

Your overall grade for this class will be curved. This curve can help your grade, but cannot hurt it. I achieve this by computing your grade using two different methods. First, I assign grades according to a percentage scale, where A = [92,100], AB = [88,92), B = [82,88), BC = [78,82), C = [70,78), D = [60,70), F = [0,60). (In other words, if you receive a grade in the class of 92% or better, then you'll receive an A.) Second, I assign grades according to a percentile scale, where A = [80,100], AB = [60,80), B = [40,60), BC = [20,40), C = [6,20), D = [3,6), F = [0,3). (In other words, if you perform better than 80% of the class, then you'll receive an A.) Your overall grade in the class is the higher of these two grades.

I strive to make all of the grading transparent and fair. If you are unhappy with the way a problem has been graded, I encourage you to discuss it with me, but you must bring the concern to me within two weeks of when you were first able to view the graded problem set or exam.

### **Learning Outcomes**

Following the completion of this course, students will be able to:

- Derive an ordinary least squares (OLS) estimator for a linear regression model
- Test theories about the true model using formal hypothesis tests
- Evaluate the expected value and variance of an estimator
- Prove that the OLS estimator is unbiased, BLUE, and consistent
- State the assumptions underpinning OLS, check for violations of these assumptions, determine the consequences of such violations, and – where possible – suggest alternative statistical approaches that are more appropriate given the circumstances
- Evaluate the extent to which econometric methods can be used to determine whether a statistical association represents a causal relationship
- Use statistical software to apply all of these statistical techniques to analyze the relationship between real-world economic variables

### **Credits**

This 4-credit course meets for two 75-minute lectures and a single 50-minute discussion session each week, with the expectation that students will work on course learning activities (reading, completing problem sets, studying, etc) for about 8 hours per week outside of the classroom.

## **Course Outline**

This course covers the following topics (readings from Wooldridge in parentheses):

- Lecture 1: Overview (Chapter 1)
- Lecture 2: Statistics Review (Appendix B)
- Lecture 3: Simple Regression (2-1, 2-2, 2-2a, and appendix 2A)
- Lecture 4: Simple Regression (2-3a, 2-3b, and 2-3c)
- Lecture 5: Simple Regression (2-4a, 2-4c, 2-5a, and 2-5b)
- Lecture 6: Simple Regression (2-5c and 2-4b)
- Lecture 7: Multiple Regression (3-2a, 3-2g, 3-2h, and 3-3b)
- Lecture 8: Multiple Regression (3-2b, 3-2c, 3-2e, 3-2f, 3-3, appendix 3A.1 and 3A.3)
- Lecture 9: Multiple Regression (3-4, 3-4a, 3-4b, 3-5, appendix 3A.5, and 6-2b)
- Lecture 10: Inference (6-2c, 4-1, 4-2, and 4-2f)
- Lecture 11: Inference (4-2, 4-2a, 4-2b, 4-2c, 4-2d, and 4-3)
- Lecture 12: Inference (4-2e, 4-4, 4-5, 4-5a, 4-5b, 4-5c, and 4-5e)
- Lecture 13: Asymptotics (5-1 and 5-2)
- Lecture 14: Dummy Variables (7-1, 7-2, 7-4b, and 7-4c)
- Lecture 15: Dummy Variables (7-2a, 7-3, 7-3a, and 7-4a)
- Lecture 16: Heteroskedasticity (8-1, 8-2, 8-3, and 8-3a)
- Lecture 17: Heteroskedasticity (8-4, 8-4a, 8-4b, and 8-4c)
- Lecture 18: Data Issues (9-4, 9-4a, 9-4b, 9-5, 9-5a, 9-5b, and 9-6)
- Lecture 19: Time Series (10-1, 10-2a, 10-2b, 10-3a, 10-3b, and 10-3c)
- Lecture 20: Time Series (10-5b, 10-5c, and 10-5e)
- Lecture 21: Panel Data (13-1, 13-2, and 14-2)
- Lecture 22: Panel Data (13-3, 14-1, and 14-2b)
- Lecture 23: Instrumental Variables (15-1, 15-1a, 15-1b, 15-2, and 15-3a)
- Lecture 24: Limited Dependent Variables (7-5 and skim all of 17-1)

## **Students with Disabilities**

If you have approval from the McBurney Center for disability-related accommodations, please contact me to discuss how these accommodations will be implemented for this course. This should be done as soon as possible, and no later than two weeks before the first midterm.

## **Religious Observances**

If an exam or problem set conflicts with a religious observance, let me know and we'll work together to make an accommodation. This should be done as soon as possible, and no later than two weeks before the conflict.

## **Grievance Procedure**

The Department of Economics has developed a grievance procedure through which you may register comments or complaints about a course, an instructor, or a teaching assistant. The Department continues to provide a course evaluation each semester in every class. If you wish to make anonymous complaints to an instructor or teaching assistant, the appropriate vehicle is the course evaluation. If you have a disagreement with an instructor or a teaching assistant, we strongly encourage you to try to resolve the dispute with him or her directly. The grievance procedure is designed for situations where neither of these channels is appropriate.

If you wish to file a grievance, you should go to room 7238 Social Science and request a Course Comment Sheet. When completing the comment sheet, you will need to provide a detailed statement that describes what aspects of the course you find unsatisfactory. You will need to sign the sheet and provide your student identification number, your address, and a phone where you can be reached. The Department plans to investigate comments fully and will respond in writing to complaints.

Your name, address, phone number, and student ID number will not be revealed to the instructor or teaching assistant involved and will be treated as confidential. The Department needs this information, because it may become necessary for a commenting student to have a meeting with the department chair or a nominee to gather additional information. A name and address are necessary for providing a written response.

## **Misconduct Statement**

Academic integrity is critical to maintaining fair and knowledge based learning at UW-Madison. Academic dishonesty is a serious violation: it undermines the bonds of trust and honesty between members of our academic community, degrades the value of your degree, and defrauds those who may eventually depend upon your knowledge and integrity.

Examples of academic misconduct include, but are not limited to: cheating on an examination (copying from another student's paper, referring to materials on the exam other than those explicitly permitted, continuing to work on an exam after the time has expired, turning in an exam for regrading after making changes to the exam), copying the homework of someone else, submitting for credit work done by someone else, stealing examinations or course materials, tampering with the grade records or with another student's work, or knowingly and intentionally assisting another student in any of the above. Students are reminded that online sources, including anonymous or unattributed ones like Wikipedia, still need to be cited like any other source; and copying from any source without attribution is considered plagiarism.

The Dept. of Economics will deal with these offenses harshly following UWS14 procedures (<http://students.wisc.edu/saja/misconduct/UWS14.html>):

1. The penalty for misconduct in most cases will be removal from the course and a failing grade,

2. The department will inform the Dean of Students as required and additional sanctions may be applied.

3. The department will keep an internal record of misconduct incidents. This information will be made available to teaching faculty writing recommendation letters and to admission offices of the School of Business and Engineering.

If you think you see incidents of misconduct, you should tell your instructor about them, in which case they will take appropriate action and protect your identity. You could also choose to contact our administrator (Tammy Herbst-Koel: [therbst@wisc.edu](mailto:therbst@wisc.edu)) and your identity will be kept confidential.