

ECO 416: Econometrics II

Instructor: Muzhe Yang

Spring 2025 (syllabus version: 01/15/2025)

E-mail: muy208@lehigh.edu

Office Hours: Tu & Th 1:30-3:00 PM

Office: Rauch Business Center 456

Web: coursesite.lehigh.edu

Class Hours: Tu & Th 3:00-4:15 PM

Class Room: Rauch Business Center 201

Course Overview

In most of economics we are interested in causal, rather than correlative, relationships among variables. For example, it is not the correlation between earnings and years of schooling that is of policy interest, but the effect of increasing someone's schooling by one year on that same person's earnings. Econometrics focuses on causal inference. Topics in this course include least squares, instrumental variables, generalized method of moments, maximum likelihood, numerical optimization, discrete choice models, sample selection models, and panel data methods.

Course Objectives

By the end of this course, students should:

1. Be able to use appropriate econometric methods for empirical economic research;
2. Understand the applicability of various econometric tools and the extent to which they allow researchers to give an estimate a causal interpretation.

Required Materials

1. A. Colin Cameron and Pravin K. Trivedi: *Microeconometrics: Methods and Applications*, 2005 (MMA).
 2. A. Colin Cameron and Pravin K. Trivedi: *Microeconometrics Using Stata, Second Edition*, 2022 (MUS).
 3. *Stata*: This software is available through [LUapps](#). Alternatively, you may go over the installation guide posted on Course Site to install this software on your computer.
- Resources and support are available [here](#). Video tutorials are available [here](#). The *Python-Stata* integration guide is available [here](#).

Recommended Materials

1. Jeffrey Wooldridge: *Econometric Analysis of Cross Section and Panel Data, Second Edition*, 2010.
2. Angrist and Pischke: *Mostly Harmless Econometrics*, 2009.

Course Requirements

My responsibilities are to come to class prepared; respond to and encourage questions and other appropriate class participation; grade problem sets; grade the final exam; and hold regular office hours.

My regular office hours are Tuesdays and Thursdays 1:30–3:00 PM, during which I will be available on Zoom or in my office—Rauch Business Center 456. To join a Zoom session for office hours, please click this [link](#). If you want to secure a 15-minute time slot for a meeting during office hours, please make a reservation by going to this [website](#), where you can select the slot (and I will then be notified automatically). If my regular office hours do not work for you, please feel free to make additional appointments with me by e-mail.

Your responsibilities are to attend and participate in lectures; complete assigned readings in time; complete all assignments on time; and take the final exam.

Grading Components

Your course grade will be based on your work on problem sets, class attendance, and the final exam. Your letter grade for the course, with plus or minus marks possible, will be assigned after the final exam is graded. The weights that will be used to compute the weighted average score, based on which the letter grade will be determined, are listed below.

Grade Components	Notes	Weights
Problem sets (PS)	Posted on course site, 10 in total	70%
Class attendance	Explained below	5%
Final exam (3 hours)	Date and location to be determined	25%

Each required grading component must be completed for a student to receive a passing grade. If you do not complete each required component, their weights will be adjusted.

Problem Sets

Problem sets include two types of exercises: analytical exercises and computer exercises using the software *Stata*. Please see the section titled “Lecture Topics and PS Due Dates” for detailed information about the due dates of all problem sets. In order for me to post answer keys to Course Site in a timely manner, please remember that problem sets cannot be accepted after the due date.

Requirements for the problem sets:

- All problem sets should be submitted online through [Course Site](#). The preferred file format is PDF.
- You may work together in a group on the problem sets. However, each person in the group must turn in his or her own set of solutions to the problem sets.

Grading of the problem sets:

- Grading uses a 0–5 scale: 5 = no major or minor errors; 4 = only a few minor errors; 3 = some major errors; 2 = many major errors; 1 = very few correct answers; 0 = Not turned in or nothing correct.

- Copying of another student's work or other outright dishonesty can result in no credit, a reduced course grade or Disciplinary Committee action.

Final Exam

The final exam will be a three-hour exam. The date and location of the exam will be determined by the Registration & Academic Services. If you are unable to take the final exam, you must follow the procedures described in the "[Definition of Grades](#)":

"The grade X (grade) is used to indicate absence from the final examination when all other course requirements have been met. In such cases, the instructor calculates the parenthetical grade by assigning an F (or zero score) for the missing final exam. The X grade may be removed by a make-up examination if the absence was for good cause (e.g., illness or other emergency). *To be eligible for a make-up exam the student must submit a petition to the Dean of Students.* If the student fails to petition, or if the petition is not granted, or if the student fails to appear for the scheduled make-up examination, then the X grade will be converted into the parenthetical grade after the first scheduled make-up examination following the receipt of the X grade. If the petition is granted and the final examination is taken, the X grade will be changed by the instructor using the make-up examination procedures and the parenthetical grade will be dropped from the transcript."

No make-up final exam will be given except on the official make-up day, which will be determined by the Office of the Registrar together with the instructor.

Attendance

It is important to attend all lectures. Each lecture covers a lot of materials and the materials are cumulative. Missing even one lecture can put you behind in a short time.

Accommodations for Students with Disabilities

Lehigh University is committed to maintaining an equitable and inclusive community and welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact Disability Support Services (DSS), provide documentation, and participate in an interactive review process. If the documentation supports a request for reasonable accommodations, DSS will provide students with a Letter of Accommodations. Students who are approved for accommodations at Lehigh should share this letter and discuss their accommodations and learning needs with instructors as early in the semester as possible. For more information or to request services, please contact Disability Support Services in person in Williams Hall, Suite 301, via phone at 610-758-4152, via email at indss@lehigh.edu, or online at <https://studentaffairs.lehigh.edu/disabilities>.

Students who are approved for testing accommodations through Disability Support Services are strongly encouraged to meet with their instructor to discuss their testing needs as soon as possible, but *no later than seven (7) business days before an exam*. In the rare event that the instructor and the department are unable to accommodate the testing needs, students are able to submit a "[Testing Services Request Form](#)" to make arrangements through the Center for Academic Success' testing services. Request forms must be submitted *at least five (5) business days prior to the exam* and will be approved on a first-come, first-served basis. Students who do not communicate with their faculty and the Center for Academic Success in a timely manner risk the opportunity for taking their exam with testing services.

Use of Citation and Advice on Avoiding Plagiarism

Please visit [this website](#) to learn when and why to cite, paraphrasing, and constructing citations.

Use of Artificial Intelligence (AI) Tools

AI tools, such as ChatGPT, can be used for: (1) making tables and figures and checking answers when working on problem sets; (2) preparing presentations. When using AI tools in cases (1) and (2), please provide appropriate citations by following the examples given [here](#).

For writing, you can only use AI tools to check grammar mistakes and to improve sentence structures. In these cases, you do *not* need to provide citations for the AI tools used.

No AI tools will be allowed in any exam.

Lehigh University Graduate Student Senate Statement on the University's Code of Conduct

"We, the representatives of the Lehigh University Graduate Senate, affirm our commitment to an intellectual community in which undergraduate students, graduate students, faculty, and staff share an obligation to uphold the highest standards of personal, professional, and academic integrity. In this partnership, we recognize our unique, multifaceted role as students, teaching assistants, research assistants, and graduate assistants. As such, each graduate student has a responsibility to fulfill his or her duties in accordance with the standards set forth by the faculty and in compliance with the University's Code of Conduct." (source: <https://studentaffairs.lehigh.edu/content/academic-integrity-resources>)

Lehigh University Policy on Harassment and Non-Discrimination

Lehigh University upholds The Principles of Our Equitable Community and is committed to providing an educational, working, co-curricular, social, and living environment for all students, staff, faculty, trustees, contract workers, and visitors that is free from harassment and discrimination on the basis of age, color, disability, gender identity or expression, genetic information, marital or familial status, national or ethnic origin, race, religion, sex, sexual orientation, or veteran status. Such harassment or discrimination is unacceptable behavior and will not be tolerated. The University strongly encourages (and, depending upon the circumstances, may require) students, faculty, staff or visitors who experience or witness harassment or discrimination, or have information about harassment or discrimination in University programs or activities, to immediately report such conduct.

If you have questions about Lehigh's Policy on Harassment and Non-Discrimination or need to report harassment or discrimination, contact the Equal Opportunity Compliance Coordinator (Alumni Memorial Building / 610.758.3535 / eocc@lehigh.edu).

The Principles of Our Equitable Community

Lehigh University is committed to [diversity, inclusion and engagement](#). Lehigh University endorses [The Principles of Our Equitable Community](#). We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.

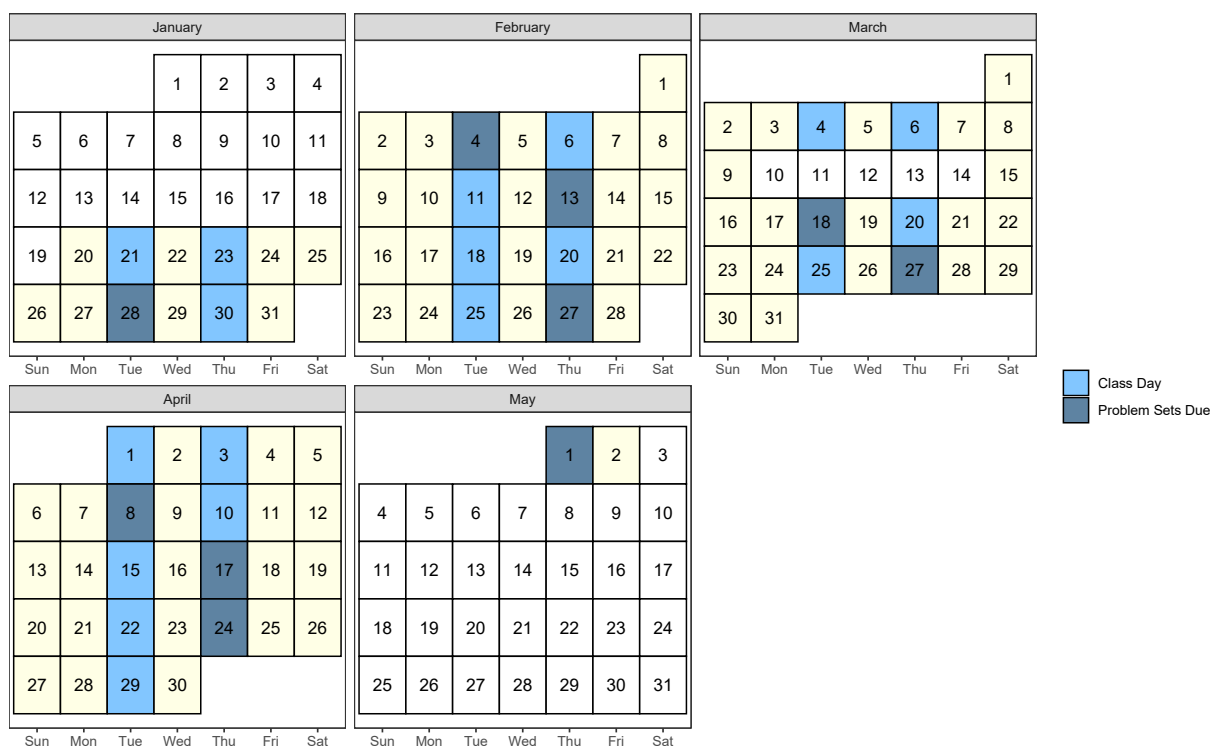


Figure 1: A Calendar for the Class (Eco 416, Spring 2025)

Lecture Topics and PS Due Dates

Week 01, 01/21 and 01/23

- Preliminaries and Stata basics
 - Readings: MMA 1–3; MUS 1–2

Week 02, 01/28 and 01/30

- Linear models: OLS
 - Readings: MMA 4.1–4.4, Appendix A; MUS 3.1–3.5, 4.1–4.5
- PS#1 due 01/28, 11:59 PM

Week 03, 02/04 and 02/06

- Linear models: GLS, FGLS and WLS
 - Readings: MMA 4.5; MUS 3.8, 6.1–6.3
- Linear models: quantile regression
 - Readings: MMA 4.2–4.3, 4.6; MUS 15.1–15.3
- PS#2 due 02/04, 11:59 PM

Week 04, 02/11 and 02/13

- Linear models: IV (OVB and ME)

- Readings: MMA 4.7–4.8; MUS 7.1, 7.3, 7.4
- PS#3 due 02/13, 11:59 PM

Week 05, 02/18 and 02/20

- Linear models: IV (GMM/GIV) and IV in practice
 - Readings: MMA 4.9; MUS 7.1, 7.3, 7.4

Week 06, 02/25 and 02/27

- Linear models: IV (LATE)
 - Readings: MMA 25.7
- Maximum likelihood
 - Readings: MMA 5.1–5.6, 5.8–5.9; MUS 13.1–13.7
- PS#4 due 02/27, 11:59 PM

Week 07, 03/04 and 03/06

- Maximum likelihood
 - Readings: MMA 5.1–5.6, 5.8–5.9; MUS 13.1–13.7

Week 08, 03/11 and 03/13: Spring Break

Week 09, 03/18 and 03/20

- Numerical optimization
 - Readings: MMA 10
- Binary outcome models
 - Readings: MMA 14.1–14.4, 14.8; MUS 17.1–17.6
- PS#5 due 03/18, 11:59 PM

Week 10, 03/25 and 03/27

- Binary outcome models
 - Readings: MMA 14.1–14.4, 14.8; MUS 17.1–17.6
- PS#6 due 03/27, 11:59 PM

Week 11, 04/01 and 04/03

- Multinomial models
 - Readings: MMA 15.1–15.9, 15.12; MUS 18.1–18.9

Week 12, 04/08 and 04/10

- Multinomial models
 - Readings: MMA 15.1–15.9, 15.12; MUS 18.1–18.9
- Tobit models and two-part model
 - Readings: MMA 16.1–16.4; MUS 19.1–19.5
- PS#7 due 04/08, 11:59 PM

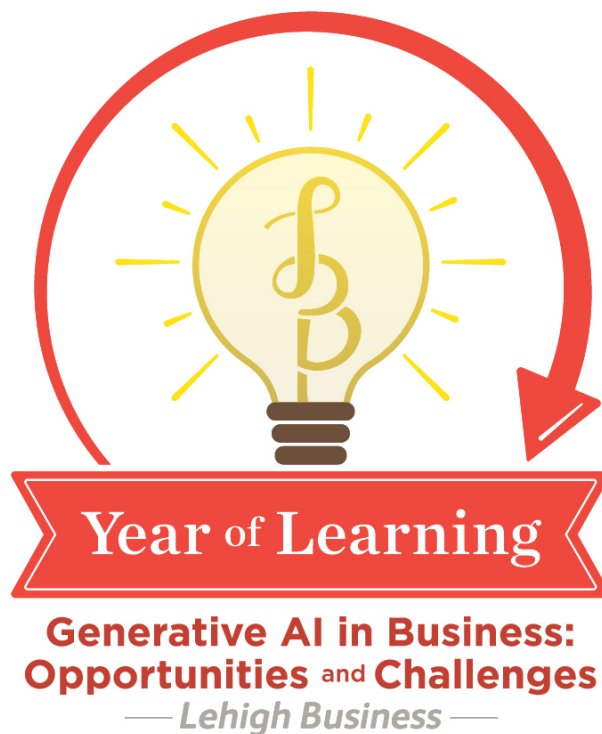


Figure 2: Year of Learning—Not Required for Discussion for PhD-Level Courses

Week 13, 04/15 and 04/17

- Two-part model, sample selection model, and Roy model
 - Readings: MMA 16.4–16.7; MUS 19.5, 19.6, 19.8
- PS#8 due 04/17, 11:59 PM

Week 14, 04/22 and 04/24

- Hypothesis tests
 - Readings: MMA 7.1–7.7, 8.3–8.4; MUS 11.1–11.7, 11.9
- Bootstrap methods
 - Readings: MMA 11.1–11.3; MUS 12.1–12.4
- PS#9 due 04/24, 11:59 PM

Week 15, 04/29 and 05/01

- Linear panel models (basics) and difference-in-differences
 - Readings: MMA 21.1–21.9; MUS 8.1–8.10; handouts
- Review session for the final exam
- PS#10 due 05/01, 11:59 PM