

# Introduction to Econometrics [EC320]

## Spring 2023 Syllabus

Andrew Dickinson, University of Oregon

### Basics

	Lecture	Lab
when	Mo. & We. 2:00p–3:20p	(see lab section below)
where	Knight Library 101	Zoom
who	<b>Andrew Dickinson</b> adickin3@uoregon.edu	<b>Colleen O’Briant</b> cobriant@uoregon.edu (Use “EC 320” in email subject.)
office hours	Tue @ 4:00p–5:00p Thu @ 4:00p–5:00p	Wed @ 4:00p–5:20p Fri @ 8:00a–9:00a (or by appointment)
materials	1. Introduction to Econometrics, 5 <sup>th</sup> ed. 2. Mastering ‘Metrics	

### Course summary

This course introduces statistical techniques that economists use to test economic theories and to estimate the relationships between economic variables. Econometrics combines economics, mathematics, and statistics with data to analyze and measure economic phenomena. In this class, we will focus our attention on regression analysis—the workhorse of applied econometrics. Using calculus and introductory statistics, we will cultivate a working understanding of the theory underpinning regression analysis, emphasizing the assumptions we must make to make causal statements. Statistical programming is fundamental to practicing applied econometrics. Thus we will teach the statistical programming language R to apply insights from theory and learn how to work with data. To the extent that you invest the requisite time and effort, you can leave this course with marketable skills in data analysis and—most importantly—a more sophisticated understanding of the notion that *correlation does not necessarily imply causation*.

## Prerequisites:

Math 242 (Calculus) and Math 243 (Introduction to Statistics) or equivalent.

## Software

- We will use the statistical programming language R.
- We will use RStudio to interact with R.

Learning R is challenging, but well worth the effort. R is a powerful and versatile tool for data analysis and visualization, which makes it popular among employers. If you dedicate the time and effort necessary to learn the language, you are likely to reap a handsome return on the job market. I expect that you install R and RStudio on your own computer. Don't worry, both are free. I also recommend that you be thoughtful of how you choose to organize your saved scripts, data, and assignments (eg Home > Documents > Classes > EC320). I will be making material available through Github for convenience.

## Recommendations<sup>1</sup>

1. Be kind
2. **Take responsibility** for your own education and try to **learn** as much as you can.
3. **Do your own work**
4. Develop your own **intuition**
5. Learn R. Struggle while you try and use Google to figure things out
6. Come to **office hours**
7. Don't wait until the end of the term to ask for help
8. Start problem sets **early**—so you can come ask for help

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<sup>1</sup>These recommendations were inspired from professor Ed Rubin's syllabus

## Labs, homework, and exams

### Lab

Labs will be delivered *asynchronously* this quarter. The scheduled Wednesday lab section will serve as an in depth help session where you may ask for help on lab assignments or ask general R questions. In lab section, you will learn to apply the concepts discussed in lecture using R. The main focus is on the practical application of statistical techniques and computational components of the bi-weekly problem sets. Lab section is *crucial* for learning the material and passing the course. Our GE Colleen will hold **additional office hours** on Friday mornings, **several hours before** labs assignments are due, to provide additional time to ask questions before lab assignments are due.

### Problem sets and lab assignments

Each week, there will be two short form assignments: problem sets and lab assignments. Lab assignments will be strictly focused on developing your computational skills in R while problem sets will primarily focus on analytical problems but may include a computational component. Submissions **must be your own work**. You will receive **zero points** for copied work. Both will be submitted on Canvas under the “Assignments” tab.

#### Problem sets

- Due on Tuesday evenings at 11:59p each week. See Canvas for exceptions.
- PDF and html are the only file types accepted for problem sets on Canvas.
- Your lowest problem set score will be dropped
- Presentation matters. You may lose points for poor penmanship, scans, and presentation.

#### Lab assignments

- Due on Friday evenings at 5:00p each week. See Canvas for exceptions.
- html is the only file type accepted for lab assignments on Canvas.
- Lab assignments will directly relate to topics covered in lab section. Use the lab section videos as a resource to complete these assignments.
- Your lowest lab assignment score will be dropped

Feel free to work together on the assignments. Unless explicitly stated, **each student is required to write and submit independent answers**. This means that word-for-word copies will not be accepted and will be viewed as academic dishonesty. In other words: You must place answers **in your own words and code**. Copying from other people (even if you worked with them) or from previous assignments is considered cheating.

## Late policy

- Late assignments will be accepted **up to 48 hours late** with a penalty of **2% per hour late**
- For example, when submitted 10 hours late, an assignment with a 90% score would be penalized by 20%, and the resulting final grade would be a 70%

## Exams

- The **midterm** will likely take place on **Monday, May 05 2023 @ 2:00-3:20**
- The **final exam** will be on **Tuesday, June 13, 2023 @ 2:45-4:45**

There will be no option to take an exam early. Please bring your *scientific calculator* and *student ID* for the exams.

## Makeup assignments

I do not give makeup assignments. In extreme circumstances that lead you to miss the midterm exam, I will consider re-weighting your grade toward the final. To qualify for re-weighting, you will need to notify me no later than two days after the exam.

## Grades

Grades for this class will be assigned based on the following assignments: (approximately) biweekly homework assignments, one midterm exam, one final exam. Final grades will be determined based on your rank-ordered position within the class (i.e., the course is curved)<sup>2</sup>. The weights for the final grade:

<b>Problem sets</b>	15%
<b>Lab assignments</b>	15%
<b>Midterm exam</b>	30%
<b>Final exam</b>	40%

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<sup>2</sup>The economics department has a uniform grading standard. In 300 and 400 level classes, roughly 65% of the class will receive A's and B's. I will not be able to tell you what your exact letter grade is at any point in time, because it depends on the scores of everyone else at the end of the course, but I will be able to give an assessment of your relative standing.

## Textbooks and other readings

**Econometrics books:** There are two required textbooks for this course:

1. Introduction to Econometrics, 5<sup>th</sup> ed. by Christopher Dougherty (**ITE**)
2. Mastering 'Metrics: The Path from Cause to Effect by Angrist and Pischke (**MM**)

You can purchase them at the UO duckstore or your preferred online bookseller. I recommend that you read the assigned readings from the textbooks *before* lecture. The lectures and the readings are meant to *complement* one another. The tentative course schedule (below) lists the assigned readings for each topic.

**R books:** For learning R, a classic is Garrett Golemund and Hadley Wickham's R for Data Science. If you have previous experience coding in R, you may want to check out Hadley Wickham's Advanced R.

## Academic integrity

I will not tolerate cheating, plagiarism, and other violations of the Student Conduct Code. If you are caught cheating or plagiarizing on any component of this course, you will receive a failing grade for the term and I will report your offense to the university.

## Accommodations

Notify me if there are aspects of this course that pose disability-related barriers to your participation. If you require special accommodations for a documented disability, then you will need to provide me a letter from the Accessible Education Center (AEC) that verifies your need and details the appropriate accommodations. Please make arrangements with the AEC by the end of Week 1. If your accommodations include exam proctoring at the AEC, then you are responsible for scheduling those exams with the AEC *at least seven days in advance*.

## Etiquette

Please respect those around you by turning off your phone and other potentially distracting devices. I ask that you stay for the entire lecture: getting up and leaving distracts your fellow classmates. If you must leave early, please position yourself near the door when you get to class.

## **Acknowledgements**

Material for this course has contributions from Ed Rubin, Kyle Raze, Philip Economides, and Emmett Saulnier, who have taught the class prior to me and graciously made their work public. I also source some material from Nick Huntington-Klein (@NickCH-K), who maintains a trove of resources for learning causal inference.

## Tentative schedule

Class	Date	Topic	Reading
01	04/03	Introduction	
02	04/05	Statistics Review I	ItE Review
03	04/10	Statistics Review II	ItE Review; MM 1 (appendix)
04	04/12	The Fundamental Econometric Problem	MM 1
05	04/17	The Logic of Regression	MM 2
06	04/19	Simple Linear Regression: Estimation I	ItE 1
07	04/24	Simple Linear Regression: Estimation II	ItE 1
08	04/26	Classical Assumptions	ItE 2
09	05/01	Simple Linear Regression: Inference	ItE 2
10	05/03	Midterm Review	
11	05/08	<b>Midterm Exam (in-class)</b>	
12	05/10	Multiple Linear Regression: Estimation	ItE 3, 6.2; MM 2 (appendix)
13	05/15	Multiple Linear Regression: Inference	ItE 3, 6.3; MM 2 (appendix)
14	05/17	Nonlinear Relationships	ItE 4
15	05/22	Qualitative Variables	ItE 5
16	05/24	Interactive Relationships	ItE 4
17	05/29	<b>Memorial Day</b> ( <i>no lecture</i> )	
18	05/31	Model Specification	ItE 6
19	06/05	Heteroskedasticity	ItE 7
20	06/05	Final Review	
	<b>06/13</b>	<b>Final Exam, 14:45</b> (see final exam schedule)	