# Syllabus

## ECO 4421: Econometrics

(Probability and Statistics for Economists)

**Instructor**: Xi Zhang
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**Office**: MAT 324

**Spring 2022**

## Course Time and Location

Tue/Thu 9:35AM – 11:30AM (Periods 3 & 4) MAT 103

## Office Hours

Thu: 3:00PM - 5:00PM

## Course Description

ECO 4421 introduces students to the theoretical concepts of probability and statistics that form the core of econometrics. The course emphasizes on understanding theoretical concepts and techniques that are used by economist to estimate economic relationships and evaluate economic policy. The first part of the course will focus on probability and statistics. In the last month of the course we will apply the theoretical concepts to practical problems in economics. We will discuss three different applications; (i) an application in education economics (the causal effect of the peers' grades on one's grade), (ii) an application in labor economics (the causal effect of education on wage), and (iii) an application in development economics (the causal effect of providing fertilizers to farmers in developing countries).

The course has the following objectives:

1. Learn the fundamental concepts of probability and statistics.
2. Learn the intuition of general statistical concepts; standard errors, hypothesis testing, and confidence intervals.
3. Learn to disentangle causation from correlation.
4. Learn the basic of the R statistical programming language.
5. Learn to use simulations in R and explore the implications when assumptions do not hold.
6. Learn how to work with data when missig at random is violated.
7. Learn how to handle selection bias and be able to interpret results accordingly.

## Prerequisites

ECO 2013 & ECO 2023 & ECO 3101. Students are expected to be familiar with basic concepts of probability and statistics. For example, students should become familiar with Appendix A, B, C in the Wooldridge textbook, including how to take partial derivatives. The class will include a refreshner of basic probability and statistics concepts and if you are not familiar with the material, you should take the time out of class to review the materials in detail.

## Texbook and Readings

The textbook for this course is Stock & Watson *Introduction to Econometrics* (third edition), Pearson. You are also be responsible for all the material covered during the lectures.
A different textbook *Introductory Econometrics: A Modern Approach* by Wooldridge (seventh edition), published by Cengage, covers the same material. If you find that a topic covered during a lecture and it is not clear from Stock and Watson, you should consider reading the corresponding section in Wooldridge.

## Software and Programming

Several of the problem sets will involve simulations and empirical analysis and will require the use of a statistical software. R is the statistical software for this course. I highly recommend that you use RStudio (https://rstudio.com) as it is more user-friendly way of using R. You are *not required* to have any prior knowledge of R or other programming experience, but you must be willing to learn. R & RStudio are installed in many computers on campus (e.g., Marston Science Library). You can easily install R on your personal computer. R is free (open source) and available for Windows, Mac, and Linux. To download R, go to https://www.r-project.org/. You are encouraged to work with other students on the problems sets, but each student must write her/his own answers.

## Assignments

There will be several problem sets in this class. Please follow the following minimal guidelines:

1. Write legibly.
    - For the students that intend to pursue graduate school, I recommend LaTeX. LaTeXis free (open source) and it is a high-quality typesetting system; features designed for the production of technical and scientific documentation, and it is available for Windows, Mac, and Linux: https://www.latex-project.org/get/
2. Please stable your problem sets if needed. I do not bring a stapler. This is your responsibility.

3. Turn in problem sets at the beginning of class. It is not fair to others if you return them in later.

4. Show your work. Even if you get the correct answer, you will often be penalized many points if you don't show your work for how you arrived at an answer.

5. You are encouraged to work with other students on the problem sets, but each student must write up their answer separately. The should not be any part of your problem set that is the same or just a rewording of what someone else wrote.

6. For problem sets requiring a computer, it is up to you to take the necessary precautions to find a way to turn the problem set in on time. It is your responsibility to turn in the problem sets on time even if your computer crashes or your internet stops (these are not valid excuses). Have always a backup plan, for example use the library computers to get access to the internet and always backup your work to protect against any unforeseen circumstances. To be clear, I won't accept any excuse for late submission or no submission at all.

# Exams

There will be three exams. The exams will be held in the same location where we meet for class. The tentative dates for the exams are as follows:

- **Exam 1: Thursday, 27 January**
- **Exam 2: Thursday, 3 March**
- **Exam 3: Tuesday, 19 April**

If you have a conflict with an exam date (e.g., a religious holiday), please e-mail me by the end of the first week of classes.

# Grades

Your final grade will be calculated as follows:

| | |
|---|---|
| Exam 1 | 15% |
| Exam 2 | 25% |
| Exam 3 | 30% |
| Assignments | 30% |
| Total | 100% |

You letter grade will be determined as follows:

| | |
|---|---|
| 93-100 | A |
| 90-92 | A- |
| 87-89 | B+ |
| 83-86 | B |
| 80-82 | B- |
| 77-79 | C+ |
| 73-76 | C |
| 70-72 | C- |
| 67-69 | D+ |
| 60-66 | D |
| 0-59 | E |

## Attendance Policy and Behavior

Irregular attendance or inattentiveness will most likely result in a substantial reduction in course performance. Econometrics requires participation and attention. Please shut off or put away lap- tops, tablets, ipods, phones and other electronic devices or toys during class, unless asked otherwise. Also notify me if you will be absent from class. I adhere to the UF attendance policy, described in detail at https://catalog.ufl.edu/ugrad/1617/regulations/info/attendance.aspx.

## Student Responsibility

Enrollment in this course constitutes acknowledgment of the following:

1. I understand that the University of Florida expects its students to be honest in all of their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action, up to and including expulsion from the University.

2. I will adhere to university copyright policies as found at http://guides.uflib.ufl.edu/copyright/.

3. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

## Course Outline

1. **Summation Operator**

2. **Probability**
   Stock and Watson, Chapter 2
   Wooldridge, Appendix B

3. **Introduction to R**

4. **Review of Statistical Inference**
   Stock and Watson, Chapter 3
   Wooldridge, Appendix C

5. **Simple Regression**
   Stock and Watson, Chapter 4
   Wooldridge, Chapter 2

6. **Regression: Hypothesis Tests and Confidence Intervals**
   Stock and Watson, Chapter 5
   Wooldridge, Chapter 4

7. **Linear Regression with Multiple Regressors**
   Stock and Watson, Chapter 6
   Wooldridge, Chapter 3

8. **Inference with Multiple Regressors**
   Stock and Watson, Chapter 7
   Wooldridge, Chapter 4