

Vanderbilt University
Department of Economics
Economics 1500
Section 03
Economic Statistics
Fall 2024

Revised September 11, 2024

Time: MW 4:00pm–5:15pm
Location: Wilson 115
Instructor: Ariell Zimran, PhD
Assistant Professor of Economics
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Office Hours: W 11:30am–1:30pm in Calhoun 420 or by appointment

Description This course provides an introductory overview of probability and statistics. The primary goal of the course is for students to be able to use data to make statements about the population from which the data came. This includes developing measures to describe the data, as well as determining how accurately these measures describe the population of interest. The first half of the course will focus on probability theory, while the second half will focus on statistics. The course is intended both to prepare students for further study in economics, econometrics, and economic history, and to give students the ability to intelligently and accurately consume statistical information that they might encounter in other venues. This is not a course in data visualization—we will be focusing primarily on theory.

Teaching Assistant Nicholas Forster-Benson (nicholas.o.forster-benson@vanderbilt.edu). Office hours T 12:00pm–2:00pm in Stevenson 1115 or by appointment.

Prerequisites MATH 1100 (Survey of Calculus), 1200 (Single-Variable Calculus I), or 1300 (Accelerated Single-Variable Calculus I). We will make use of calculus concepts in the course, so I am firm on this prerequisite. I have prepared a brief review document on integration of polynomials (the main concept that we will use) and posted it on Brightspace.

Note This is my first time teaching this course, and I only learned that I would be teaching it a few weeks before the start of the semester. For this reason, everything on this syllabus is subject to change and I am still in the process of determining the precise timing of when we will cover particular topics or when particular assignments and exams will occur. I will do my best to update this information as far in advance as possible.

Note also that I am expecting a child in January 2025. If all goes according to plan, this will have no impact on the course. But if the child arrives early or there is some other unexpected event, I may need to move some things around on short notice late in the semester.

Request I welcome feedback and constructive criticism—if you have any questions, concerns, or suggestions, please feel free to discuss them with me. It is most valuable to you if you provide feedback during the course so I can make use of it immediately (rather than it benefitting only next year’s students). Even if I am not able to make changes to address your requests and suggestions, it is helpful to be aware of your perspective.

Course Materials I had originally planned to require a textbook: Lind, Douglas, William Marchal, and Samuel Wathen (2024). *Statistical Techniques in Business and Economics*, 19th Edition. McGraw Hill.

ISBN13: 9781265322465. As a result, you will see it listed as “required” by the bookstore. But **I have decided that we will not use this book, so you do not need to purchase it.**

Instead, the course will be based on the following textbook: Ashenfelter, Orley, David J. Zimmerman, and Phillip B. Levine (2003). *Statistics and Econometrics: Methods and Applications*. Wiley. ISBN13: 9780471107873. Unfortunately this book is out of print. As a result, the primary material for the course will be the lecture notes that I deliver in class. I may also circulate handouts from time to time. I am working with the library to put a copy on reserve for those who wish to consult the book, or you can look for a used copy to purchase online.

You will need a calculator for homework assignments and exams. A simple calculator is fine (i.e., you will not need a graphing calculator). You may use whatever calculator you wish for homework assignments. No smartphone calculators will be permitted on exams.

You will need access to Microsoft Excel, which we will use at times to perform computations that are too complex to perform manually or to analyze data, either in class or on homework assignments. You may use other software if you wish, but Excel is the “supported” software for the class. You will not need (nor will you be permitted to use) Excel for exams.

Brightspace will be used to circulate other course materials, such as handouts and problem sets.

Evaluation

- *Problem Sets* (15%). Most weeks, there will be a problem set that you must complete. Hard copies of your completed problem sets will be due in class at a time to be specified for each assignment. The plan at this point is to circulate the assignments after class on Wednesday and for them to be due the following Wednesday in class. These assignments are intended to provide you with an opportunity to practice and test yourself on the course material, and completing them is the single best way to prepare for the exams. The assignments will be graded for completion—if, in the judgment of the TA, you made a clear effort to complete assignment, you will receive full credit; otherwise you will receive no or partial credit at the TA’s discretion. That is, the bar for these assignments is low (because they are intended as practice, not as assessments), but the penalty for not meeting that bar is high. You are encouraged to work together with your classmates on the problem sets, but each student must submit their own assignment. Your 3 lowest problem set scores for the semester will be dropped.
- *Midterm Examinations* (45%). There will be two in-class midterm examinations, currently scheduled for **Wednesday, September 25** and **Wednesday, October 30**. Each examination will be equally weighted (i.e., each will be worth 22.5% of your final grade) and will be non-cumulative (except insofar as the material is naturally cumulative). The first midterm is currently scheduled to cover weeks 2–6 of the course (Basic Probability Theory, Random Variables and Probability Distributions, and the Mathematics of Expectations) and the second midterm is scheduled to cover weeks 7–10 (Multivariate Distributions and Sampling and Sampling Distributions). No make-up exams will be offered: if you miss a midterm, you will either receive a grade of zero (if the absence is not excused) or have the weight of the exam shifted to the final (if the absence is excused). You will be permitted to bring a limited set of notes to the exams; more details will be discussed in class.
- *Final Examination* (40%). The final examination will be given in person in our normal classroom on **Monday, December 9, from 9:00am–11:00am**. The final exam will be cumulative. **No alternate exam will be offered.** You will be permitted to bring a limited set of notes to the exam; more details will be discussed in class.

The correspondence of numerical scores to course grades will be as follows.

A	94–100
A-	90–93
B+	87–89
B	83–86
B-	80–82
C+	77–79
C	73–76
C-	70–72
D+	67–69
D	63–66
D-	60–62
F	below 60

Scores will be rounded to the nearest whole number.

How to do well in this course Here is a non-comprehensive list of tips on how to well in this class:

- Make sure you don't fall behind. As with any mathematical subject, each topic builds on the last, so if you get lost and do not do something about it quickly, the problem will only snowball.
- To avoid falling behind, be sure to study the material as we go over it rather than waiting until there is an exam. That is, after each class, you should take some time to go back over your notes to see what you understand and what you don't, including working through all of the proofs that we go over in class. This will help you solidify your grasp on the material and will encourage you to get help on things you didn't understand. You should also note that an implication of this recommendation is that simply attending class and completing assignments is not sufficient to succeed in the class. I also expect you to devote time to studying the material outside of class.
- Take the homework assignments seriously. You can easily get full credit on these without really putting in the effort, but they will only be useful if you take them seriously and try to solve all the problems to the best of your ability.
- Some degree of frustration in studying and preparing assignments is healthy, and overcoming it is a valuable part of the learning process. But if you are spending hours on end trying to understand something and it isn't happening, it's probably time to ask someone for help.
- Building on the above, if you don't understand something, make sure to ask for help. I suggest that you take advantage of at least the following three mechanisms:
 - Speak up in class. If, at the time I teach something, it doesn't make sense to you, odds are that you are not the only one who didn't understand. Don't be shy to say so—it's better to resolve the confusion immediately and for the whole class. And if, after studying the material from a previous class, you don't understand something, please ask in class—I will (almost) always set aside time at the beginning of class for questions. Again, if you are confused by something, odds are that someone else is.
 - Do not be shy to ask me or the TA for help in office hours. We are here to help you, but you have to tell us that you need help. Even if you are so confused that you don't know what questions to ask, we can still help.
 - Talk to your classmates. You might consider forming a study group if you think that would be helpful.
- Statistics and econometrics are the subjects where I most often encounter students saying that they simply "don't get it" or that the subject is "too hard," and use these statements as excuses to give up on the class. All of you are capable of succeeding in this course as long as you put in the effort, and the TA and I are here to help.

Policies

- *Minimum Requirements.* To pass the class, students must, at minimum, complete the final examination. Note that this is a necessary condition but not a sufficient condition. The College of Arts and Science's policy on incomplete grades details the circumstances under which the final may be completed after the conclusion of the semester.
- *Late Assignments.* **Late assignments will not be accepted for any reason. No extensions will be granted, so please do not ask.** If you submit an assignment late, you will receive a grade of zero. The policy of dropping the lowest three problem set grades is there not to let you skip assignments, but to account for cases in which you may have something come up that prevents you from completing an assignment on time. (Even if you do not complete an assignment on time, you should still complete it in order to get the practice. But you will not receive credit for doing so.) If, for some reason, you have a situation that prevents you from completing more than three assignments, please speak to me.
- *Academic Integrity.* I trust that all of you will be honest and honorable in your behavior in this course. Cases of suspected academic dishonesty will be addressed in accordance with Vanderbilt University's Honor System. Each exam and assignment has guidelines listed above as to whether you are permitted to collaborate with your classmates, and I will make these expectations clear again when the assignment is circulated. Please speak to me or the TA if you are ever unsure of what is permissible.
- *Accessibility.* Students should contact Student Access Services for specific accommodations. If there are any circumstances that make our learning environment and activities difficult, please let me know as soon as possible.
- *Use of Artificial Intelligence.* The use of artificial intelligence to complete any assignment or examination in the class is strictly prohibited. You are welcome to consult artificial intelligence as a learning aid similar to an internet search. For instance, if you are working on an assignment and decide to look on Wikipedia or some other source for an alternate explanation of a concept, that is fine, and you may use AI for analogous purposes. But you may not ask AI to solve a problem for you. If you are ever unsure as to what is permissible, please consult me.
- *Technology.* Unless required for accessibility reasons, laptops, tablets, and any other electronics are prohibited in class. The exception to this is that, at times, we may use Microsoft Excel in class, so you will want to have your laptop available (I will do my best to inform you in advance if I intend to use Excel on a particular day). Mobile phones are to be kept in bags or pockets throughout the class. This means that you will need a pen or pencil and paper to take notes. This policy is based on a considerable body of evidence that shows that learning outcomes are better when technology is excluded from the classroom. Recording or photographing any part of a lecture is also prohibited.
- *Regrade Policy.* If you would like for an assignment or exam to be regraded, the following policies apply.
 - Regrade requests will be accepted only until the beginning of the second class period after the assignment or exam is returned to you. (So if an assignment is returned on Wednesday in class, you have until the start of class the following Wednesday to submit a regrade request, assuming we are meeting as usual.)
 - The TA is not authorized to accept regrade requests. They must all be submitted to me.
 - Regrade requests must be made in writing and in hard copy. You must explain the reason for your regrade request in writing, and attach a typewritten hard copy of this explanation to the hard copy of your assignment or exam.
 - I will regrade the entirety of the assignment or exam, not just the portion that you believe to have been misgraded, so you risk receiving a lower score as a result of your request rather than a higher one.
 - Each assignment or exam may be submitted for a regrade at most once.

Schedule of Meetings and Topics This schedule is highly preliminary and subject to change. Please make sure that you have the most recent version of the syllabus.

Week	Dates	Topic
Part I: Probability		
1	Aug. 21	Course Overview
2	Aug. 26–28	Basic Probability Theory
3	Sep. 2	No Class
	Sep. 4	Random Variables and Probability Distributions
4	Sep. 9–11	Random Variables and Probability Distributions
5	Sep. 16–18	Mathematics of Expectations
6	Sep. 23	Mathematics of Expectations
	Sep. 25	Midterm 1
7	Sep. 30	Multivariate Distributions
	Oct. 2	No Class
8	Oct. 7–9	Multivariate Distributions
Part II: Statistics		
9	Oct. 14–16	Sampling and Sampling Distributions
10	Oct. 21–23	Sampling and Sampling Distributions
11	Oct. 28	Estimation
	Oct. 30	Midterm 2
12	Nov. 4	Estimation
	Nov. 6	Interval Estimation and Hypothesis Testing
13	Nov. 11–13	Interval Estimation and Hypothesis Testing
14	Nov. 18	Interval Estimation and Hypothesis Testing
	Nov. 20	No Class
	Nov. 25–27	Thanksgiving Break—No Class
15	Dec. 2–4	Simple Linear Regression
	Dec. 9, 9–11am	Final Exam