Econ 220
Probability and Statistics for Economists
Fall 2018

Most important rule for this class: read the syllabus! All the information you need is contained in the syllabus.

Time and Location: TT 2:30pm-3:45pm, White Hall 102 (Lab session Fri 3:00pm WH 102)

Office Hours: My regular office hours for the Fall Semester are on Wednesday 2:00pm-3:30pm, Thursday 4:00pm-5:00pm or by appointment. Please try not to come to see me outside my office hours.

Questions: You can come to my office hours. In addition, often I finish my lectures 5 minutes earlier and I stay around for a while so, if you have a conflict with my office hours, you can always talk to me after class or make an appointment. Piazza will also be your best place to ask questions. I will monitor Piazza routinely and your colleagues may reply before me.

Tutoring: For tutoring check the information at the web page http://www.emory.edu/-College/Econ/tutor.htm


Suggested: (much easier and more “fluffy” but lots of examples and intuitions) “Business Statistics: Communicating with Numbers” by Sanjiv and Alison (McGraw-Hill)

Readings: “Naked Statistics: Stripping the Dread from the Data” by Charles Wheelan. We will read this throughout the course and you will have to write a couple of paragraphs of book report due every one or two weeks.

I have requested all three books to be on three hours reserve at the library.

Piazza: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. Find our class page on Canvas or at https://piazza.com/emory/fall2018/fa18_econ_220_3/home
Honor Code: The honor code is in effect throughout the semester. By taking this course, you affirm that it is a violation of the code to cheat on exams, to plagiarize, to deviate from the teacher’s instructions about collaboration on work that is submitted for grades, to give false information to a faculty member of the TA, and to undertake any other form of academic misconduct. You agree that the teacher is entitled to move you to another seat during examinations, without explanation. You also affirm that if you witness others violating the code you have a duty to report them to the honor council.

Grading: There will be two midterm exams and a final exam. Additional mandatory homework will be given during the semester. Homework are due in class not later than 10 minutes after the start of the class. Any material turned in after that time, or given to me by email, will be considered late. You will also have to write a few paragraph report of the chapter you will read from Naked Statistics. You will turn these in on Canvas. Finally, the lab class will have separate assignments that will be decided by the instructor for that class. The assignments will count toward the grade as follows.

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<td>Midterm 1</td>
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<td>Midterm 2</td>
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<td>Final</td>
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<td>Assignments (8-10)</td>
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<td>Empirical/lab</td>
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<td>Book reports and participation</td>
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NOTE: You will be able to drop one homework. So if you miss one it is not a big deal. If you do not miss any, I will automatically drop the homework with lowest grade from your assignments averages.

Attendance to the class is not required but it is strongly recommended as the exams are mostly based on the materials given during class. Bonus points will be awarded randomly during classes.

The distribution of the grades will be as follow:

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<tr>
<th>Grade</th>
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Important dates:

- **Thu October 4**             Midterm 1
- **Tue November 6**           Midterm 2
- **Fri December 14 or ??**   Midterm 3

**Statistical package:** In this class, we will be learning R. The instructor in your lab class will direct to what you should install in your laptop. Please install R and R studio before the first class. See instructions on how to do that in Canvas.

**Canvas:** I will be using Canvas for all the course information. Please make sure you check it every day and get the notifications. All the relevant information for the course will be there.

**Course Description.** In this course, we will learn what the science of statistics is and how statistics is present in our everyday life. We will learn how statistics is applied to Economics and the Social Sciences in general. We will learn the tools you will need in Econ 320 when you will learn Linear Regression Analysis. We will learn why people say that everyone should learn statistics!

I see an introductory Statistics course as having 5 distinct modules.

1. First, we will introduce probability theory and we will learn how we assign probability to events and how we handle multiple simultaneous events.
2. We will then learn how we go from probability to random variables. We will understand distributions, moments, and how to work with the expectation operator. Joint random variables will take a central role with emphasis on conditional and unconditional expectations, correlation and independence.
3. Next will be the most important part of the class, Inference. We will spend most of the time here with emphasis of understanding the sampling distribution, the difference between a population and a sample, and between parameters and estimators.
4. By this point you will have learned that descriptive statistics are nothing else that estimators for the properties of the population distribution. We will look at some fun describing statistics and we will briefly introduce the hot topic of Data Visualization. This should be a fun week with lots of fun examples and videos to give us a break from the math.
5. The final part is hypothesis testing. It is important that you understand this very important part before moving on to 320. P-values and confidence intervals will be emphasized. By this point, you will be able to quick work through many interesting questions using real data.

For all the topics, Intuition and examples will be a priority. At the same time, mathematical derivations are important to fully understand how things work: we will not shy away from mathematical proofs.
when they are relevant and important for the intuition.

Topics

- Week 1-3 Probability Theory (Chp 3)
  - Random Experiments, Outcome and Events
  - Probability and its postulates
  - Probability rules
  - Bivariate probabilities and Bayes Theorem

- Week 3-4: From Probability Theory to random variables (RV) (Chp 4 and 5)
  - From Probability to Random Variables
  - Probability Distribution of Discrete RVs
  - Some important Discrete Distributions
  - Jointly Distributes Discrete RVs
  - Probability Distribution of Continuous RVs
  - Some important Continuous Distributions
  - Jointly Distributes Continuous RVs

- Week 4-6: Multiple RVs, conditional distribution, transformations of RVs (Chp 4 and 5 and notes)
  - Joint RVs
  - Conditional Distributions
  - The important of the conditional Mean
  - The Distribution of Transformation of RVs

- Week 7-9: Sampling distribution, what is a “statistics” (Chp 6)
  - Sampling from a Population
  - The difference between sample and population, parameters and estimators
  - What is a Statistics
  - Sampling Distribution of Statistics
  - Desired Properties of Statistics
  - Sampling Distribution of the sample mean and Sample variance (which we already did last week)
  - Asymptotic/Large Sample Approximation of the distribution of a statistics
  - The Law and Large Numbers and the Central Limit Theorem

- Week 9-12: Inference: Point Estimators, Evaluation of Point Estimators, LLN and CLT (Chp 7 and Chp 8)
  - Point Estimators
  - Different Estimation Methods (not in the book)
  - Evaluation of Estimators
  - Small Samples Versus Large Samples
  - Estimators for the mean and variances of a normal distribution and their properties
  - The Law of Large Numbers and the Central Limit Theorem
  - Estimation of the difference between two normal population means
- Week 12: Descriptive statistics and data visualization (Chp 1-2)
  - Why everyone does talks about descriptive statistics.
  - Describing Data with Graphs (Data visualization)
  - Descriptive Statistics and Graphics
  - Intro to Random Sample
  - Introduction to different Type of data
  - Some Descriptive statistics for developing and developed countries

- Week 13-15: Hypothesis Testing and Confidence Intervals (Chp 9-10)
  - Intuition
  - Testing Procedure, Type I and Type II errors
  - Tests for Single Population, Small Samples
  - Tests for Single Population, Large Samples
  - P-values
  - Confidence Intervals