ECON 2250 Statistics for Economists

Spring 2024

Instructor:	Emtiaz Hritan	**Time:**	Tuesday and Thursday 09:30 AM - 10:45 AM
Email:	hritan@gatech.edu	**Place:**	Clough UG Learning Commons, Room 262

Office Hours:

- Instructor : Emtiaz Hritan

  Monday 11.00 a.m. to 1 p.m. G310, SOE,221 Bobby Dodd Way, Old CE Building,

  Friday 3.00 p.m. to 4.00 p.m. on Microsoft Teams: Link

- TA: Anushka Mukhopadhyay
  E-mail:amukhopa9@gatech.edu
  Friday 11:00 a.m.-12:00p.m.
  On Zoom: Link

Description:

Have you considered how one variable impacts another, like the Russian invasion in Ukraine affecting Atlanta's gas prices? In a vast dataset, how do you determine which information is crucial for optimal decision-making? How can you establish a causal link between two economic variables? Does attending a private school correlate with higher future income? Or does increased pay lead to greater productivity? What about patterns in UberEats/Instacart promotions—if you order more, are you more likely to receive offers? How are these promotions decided, and can you increase your lottery winning chances? If these questions intrigue you, this course is your answer. Economics uniquely merges mathematics and statistics tools with economic theories to address real-world issues. This course covers the essentials of statistics and their application in economics, focusing on probability, random variables, sample distributions, hypothesis testing, and linear regressions. This course provides an opportunity to learn a widely used and powerful statistical software called Stata—which can be used in data processing, data manipulations/transformations, data visualization, data analysis and useful programming. By the end of the course, you'll be adept at identifying and evaluating variable relationships and providing causal and economic interpretations. This course lays a solid groundwork for future econometrics and quantitative economics studies.

Pre- &/or Co-Requisites:

Pre-requisites: Undergraduate Semester level MATH 1501 Minimum Grade of D and Undergraduate Semester level MATH 1502 Minimum Grade of D) or (Undergraduate Semester level MATH 1711 Minimum Grade of D and Undergraduate Semester level MATH 1712 Minimum Grade of D. Basic knowledge on counting (combinations, permutations), average, variance, probability would be helpful, however, no prior knowledge on statistics is required.

Course Goals and Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Describe the types of data, methods of describing data and different types of sampling distributions.
2. Demonstrate the concepts of probability theory, random variables, hypothesis testing and linear regressions.
3. Estimate simple and multiple regression models and interpret the results.
4. Explain the core ideas of probability theory and statistical inference and the application of these in the study of economics.
5. Gain a familiarity with Stata –a statistical software widely used by economists, such a level that they can carry out the final projects and the application portion of subsequent econometrics courses on their own.
6. Explain the statistical concepts necessary for econometrics in their own words and get enough preparation for ECON 3161:Econometric Analysis
7. Communicate as an empirical economist meaning able to formulate and discuss ideas using economic data analysis.

Course Requirements & Grading:

Assignment	Date	Weight (Percentage)
Class participation	NA	5
Weekly Homework (8)	See course schedule	15
Quiz/Test (6)	See course schedule	10
Exam I	29- February (Thursday)	25
Exam II	18—April (Thursday)	25
Final Project	Draft I 11—Feb (Sunday) Draft II 14—Feb (Sunday) Final 30—April (Wednesday)	20

Extra Credits Opportunities:

There will be various opportunities for bonus points and extra credits throughout the semester. Bonus points will come from midterm and final exams where students can gain points by successfully solving advanced or complex problems (not attempting those problems will not affect your grades and there is no bonus point just for attempt). Extra credits will be given for excellent answers or questions in the class. Total bonus or extra points will not exceed the weight of any graded component (must be less than or equal to 5 percent of the total grades).

Description of Graded Components

Class participation:

Daily Class Participation Grading Rubric	
Absent	0
Present and distracted (on cell phone or laptop (except note taking), sleeping, otherwise not engaged)	25
Present, focused, not prepared for class (missing class notes or handouts), not participating in discussion, not working with others when requested.	75
Present, focused, prepared for class (dedicated class notebook and handouts), actively participate in a productive manner (demonstrate read content before class and are prepared for class discussion, ask questions), work with others when requested.	100
Arrive late, take extended breaks during class time, leave early	-25
Monopolize conversation, contribute in unproductive manner (e.g., off topic), disreptful to classmates	-25

Biweekly Homework

You will submit eight Homework Assignments, all via Canvas. Your two lowest scores out of these eight assignments will be dropped in the calculation of your average. You may discuss and work with other students, but each student must write and submit their own homework solutions. For submitting your homework, you have two options: either hand-write your answers, take a photograph, and submit them as a PDF, or type your responses in Word/LaTeX and convert them to PDF format for submission. Late homework assignment submissions will be accepted for up to 2 working days (M-F) after the due date, for a penalty of 2 points per day. After 2 days, late submissions will not be accepted and will be counted as a zero.

Quiz/Test

You will complete 6 "Chapter Tests' in class. You will be allowed 25 minutes in class (depending on the number of questions). Tests will include multiple choice questions, true/false, fill-in-the-blanks, small

conceptual or short math questions. For the quiz component of the course, please note that make-up quizzes or rescheduling are not available. To accommodate unforeseen circumstances, only the best five scores from a total of six quizzes will be considered for your average. This policy allows you the flexibility to miss one quiz without impacting your overall quiz score.

Exam I and II

The Exams will be completed in class on the date specified in the Course Schedule. The Exam includes conceptual and calculations-based questions with 3/4 separate parts. You will be allowed 75 minutes, one attempt, and one 8.5"x11" sheet of hand written notes (one side). No extensions, re-scheduling or make-up of exams are permitted except the following events:

- Participation in a particular religious observance (You have to notify at least 1 week before the day)
- Participation in approved institute activities (such as field trips, professional conferences, career fair and athletic events)
- In the event of a medical emergency or an illness that is severe enough to require medical attention

Final project

The final project involves submitting a Data Analysis Portfolio (DAP), which will be completed as a group project with a maximum of four members per group. This project will consist of three parts:

- Research question, data specification, download and summary of data
- Graphical and correlational analysis
- Regression analysis and hypothesis testing

All the data analysis will be done on Stata software (freely available on virtual lab). The purpose of this assignment is to make sure that you are capable of applying the classroom statistical knowledge on economic data. Moreover, this assignment requires you to practice skills like: coding, summarizing data, graphical and correlational analysis, formulating ideas and applying knowledge in a real world problem and the ability to analyze a real life problem and provide solutions based on economic rationale. At the end, this assignment will make you familiar with/test your level of understanding on the following concepts: types of data, descriptive statistics, probability distribution, hypothesis testing and linear regressions.

For tasks, time-frame and criteria for success, please have a look at the 'final project instructions' file on canvas.

Grading Scale:

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Course Materials:

Course Text

James T.McClave, P.George Benson, Terry Sincich, Statistics for Business and Economists, The Pearson Press, 14th/13th Edition

You can purchase this book from Barnes & Noble at Georgia Tech, 48 5th St NW, Atlanta, GA 30308 For e-text version, I recommend Pearson's website: here.

You can also purchase or rent old copy at `www.amazon.com` Moreover, I'll upload the pdf of important parts of individual chapters (not the whole book and not the 14th edition).

Additional Materials/Resources

- Software:
  We will use Stata (version 16 or 17) which is available on Georgia Tech Vlab.
  1. Login to the VLab - `https://mycloud.gatech.edu`
  2. Click Desktops in the top center
  3. Open IAC-VLAB-2022 (or 23)
     Use of Stata in class will be limited (to save time!). I have already uploaded all the necessary Stata tutorial videos on canvas. No question on Stata will be asked on exams/quizzes. However, you need Stata to carry out the final project (and some homework).
- Supplies: Scantron sheets (will be provided); calculator; colored pens or pencils; access to Word, Excel, the internet, and a scanner (or a good cellphone camera).
- Supplementary Texts: If you find the required text difficult or need more examples or more intuitive treatments, I advise consulting the following book:

  Anderson, Sweeney, Williams, Camm, Cochran (2014) Statistics for Business and Economics, Revised 12th ed., Cengage Learning.

  If you are good at calculus, this following book will be great (a little advanced):

  Goldsman, David, and Paul Goldsman. "A First Course in Probability and Statistics." (2020)

  All other great statistics and probability books are available at Georgia Tech library (Contact: Charlie Bennett, expert librarian on economics textbook, Email: csb@gatech.edu). You don't need to purchase any of these books.

Course Website and Other Classroom Management Tools:

All the study materials and grades will be posted regularly on the canvas website:

`https://gatech.instructure.com/courses/370458`

All grades will be posted within the two-week grading turnaround period. Notify me immediately if the grade book is not current and accurate. Please notify me within a week of feedback for re-grading and re-submission via email. Please do not wait until the end of the semester.

Course Expectations & Guidelines:

Each week, students should expect to complete homework assignments. No homework assignments will be due before the content is covered in class. However, Most assignments will be open while the content is being covered in class. Due dates may not all be on the same day each week.
Students should expect to work on written work (final project, homework) every week. These assignments provide opportunities to apply and interpret the material. All written work will be posted to Canvas and be submitted to Canvas (and possibly Turnitin).

Do not wait until the due date to begin or to submit assignments. Best practice is to work on assignments daily. Once submitted and the assignment is closed, review your work and study for the test. Then, get started on the assignments for the next chapter while the material is still fresh.

Time Expectation:

For a 3 credit hour, 16-week seated course, expect to spend 3 hours per week in class and 5-7 hours outside of class each week reading the text, studying class notes, working practice problems, doing homework, taking tests, collecting data, completing writing assignments, etc. To be successful in the course, time must be spread across multiple days throughout the week. It is unrealistic to expect a high grade in this course if you only allocate one night before the exams or final project.

Academic Integrity:

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/. Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

AI and Homework Site Policy:

Using Artificial Intelligence (AI) programs, such as Chat GPT, to produce your work is considered plagiarism. The use of chat bots in your writing process is strictly prohibited. Should AI-generated writing be suspected, your final project and homework assignments may undergo AI detection analysis. The first occurrence of academic dishonesty will result in a zero for the involved assignment. A second violation may lead to a referral to the Office of Student Integrity for investigation and determination of appropriate penalties. Furthermore, the use of homework sites (e.g., Course Hero, Chegg) to obtain homework solutions or to reuse projects from prior students or your previous coursework is prohibited and will be subject to similar consequences.

Accommodations for Students with Disabilities:

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Attendance and/or Participation:

- You will get the most benefit from this class if you attend regularly, arrive on time, come prepared, and remain for the entire class period.
- Attendance alone does not constitute the basis for a passing grade in this class.
- Class begins promptly at the scheduled start time. Please make sure to avoid the following situations: you are not in the classroom at the right time, you drop off your personal supplies, leave the classroom, and then return after the scheduled start time or you leave the classroom before the scheduled end time.
- You are responsible for all content covered in class and all announcements made during class, whether in attendance or not. Instructors are not expected to reteach content or to post announcements that were missed due to absence.
- If you are late to class, you will not be given extra time to complete in-class activities (including exams and quizzes).
- It is your responsibility to notify the instructor (after class) if you miss signing the attendance sheet due to late arrival. The instructor's attendance record is the official record.
- Pop-quizzes for extra credits may be given in class with no advance notice. If you miss the quiz due to absence, you will receive a zero on the quiz. No make-ups will be given for this type of quizzes.
- Homework and writing assignments are to be completed outside of class and not during class time.

When absence is permitted:

- Participation in a particular religious observance
- Participation in approved institute activities (such as field trips, professional conferences, career fair and athletic events)
- In the event of a medical emergency or an illness that is severe enough to require medical attention

Collaboration & Group Work:

You are encouraged to interact with other students outside the classroom to discuss the homework and study for exams, but no formal group assignments are assigned except the final project and in-class activities.

Student-Faculty Expectations Agreement:

In order to create a mutually respectful classroom environment, I abide by the principles for student-faculty expectations laid out by Georgia Tech. This means that I will:

- Create a positive, engaged academic environment;
- Be available to meet with you outside of class at a mutually convenient time;
- Provide you in advance with all necessary materials so that you can complete all course assignments;
- Make my grading criteria and rubrics available to you so that you understand how I evaluate your assignments.

In turn, I expect that you too will fulfill your responsibilities. Specifically, I expect that:

- You will work with me to create a respectful, engaged academic environment;
- You will attend classes regularly and on time;
- You will attend exams and presentations unless you have an emergency or formal, pre-approved excused absence;
- You will come to class prepared, having read the required material, and ready to engage in class discussions;
- You will adhere to the principles of Georgia Tech Student Honor Code.

You can review exactly what Georgia Tech's student-faculty expectations are at http://catalog.gatech.edu/rules/22/

Student Use of Mobile Devices in the Classroom:

As research on learning shows, unexpected noises and movement automatically divert and capture people's attention, which means you are affecting everyone's learning experience if your cell phone, tablet, laptop, etc. makes noise or is visually distracting during class. That said, many students find it useful to have an electronic device on hand to access course materials.
With this in mind, I allow you to take notes on your laptop, but request that you turn the sound off so that you do not disrupt other students' learning. In addition, if you are doing anything other than taking notes or looking at course materials on your laptop, please sit in the back row so that other students are not distracted by your screen. Please keep in mind that, it continues for every classes, it will affect your classroom participation scores. (See 'Daily Class Participation Grading Rubric' in page 3)

Additional Course Policies:

- Eating food in class is strictly prohibited, however, you can drink in the classroom (Obviously no alcohol!)
- You have the freedom of expression (I welcome all political viewpoints). Please try to keep the discussion positive (as economists do), not normative (as activists do).
- Please notify me within a week of feedback for re-grading and re-submission via email.
- Please do not record the class activities without prior permission
- No pet please (exception: emotional support animals with proper documents; given that other students are comfortable)

Withdrawal Policy:

It is the student's responsibility to withdraw from a class by March 13, 2024 4:00 PM. Failure to follow the withdrawal procedure will result in a final grade in the course equal to the grade earned in the course. Students are encouraged to consult with their instructor and a financial aid counselor (if applicable) before withdrawing from the course.

Campus Resources for Students:

- Georgia Tech Counseling Center: Smithgall Student Services Building, Suite 238 , 404-894-2575
  The Counseling Center offers a full range of counseling and psychological services to help facilitate lifelong personal development, promote mental health, and prevent or reduce stress. Services include: individual, group or couples counseling, workshops, emergency & crisis services, testing & assessment, referral services, Collegiate Recovery Program, and the Peer Coaching Program.

- Stamps Health Services: Stamps Health Center, 740 Ferst Drive, 404-894-1420

- Office of Disability Services: Smithgall Student Services Building, Suite 123 404-894-2563 (voice), 404-894-1664 (TDD), Email: dsinfo@gatech.edu
  The Office of Disability Services is committed to continuing to provide guidance and resources for students with disabilities.

- Office of the Dean of Students, Division of Student Life: Smithgall Student Services Building, Suite 210, 404-894-6367
  The Division supports the mission of Georgia Tech by enhancing the student experience through programs and services that focus on student transition, learning, leadership, wellness and success, as well as student and parent engagement.

Course Schedule

Week	Day	Date	Chapter	Reading, Notes, due dates, and more
1	Tuesday Thursday	09- January 11- January	1	Introduction: Syllabus review, Attendance policy, Expectations Statistics, Data, and Statistical Thinking
	Friday	12- January	Registration Schedule Change Deadline	
2	Tuesday Thursday	16- January 18- January	2	Methods for Describing Sets of Data
	Sunday	21- January	1	Homework 1 due (11.59 pm)
3	Tuesday	23- January	2	Methods for Describing Sets of Data
	Thursday	25- January	2	Methods for Describing Sets of Data
	Sunday	28- January	2	Homework 2 due (11.59 pm)
4	Tuesday Thursday	30- January 01- Feb	2,3 1,2	Methods for Describing Data, Probability Quiz 1 (in-class)
	Sunday	04- Feb	3.1, 3.2	Homework 3 due
5	Tuesday Thursday	06- Feb 08- Feb	3 4	Probability Random Variables and Probability Distributions
	Sunday	11- Feb	3,4	Homework 4 due (11.59 pm)
				Final Project (Part I)
6	Tuesday Thursday	13- Feb 15- Feb	5 3,4	Sampling Distributions Quiz 2 (in-class)
	Sunday	18- Feb	5	Homework 5 due (11.59 pm)
7	Tuesday Thursday	20- Feb 22- Feb	6	Inferences Based on a Single Sample: Estimation with Confidence Intervals
	Thursday	22- Feb	5,6	Quiz 3 (in class)
	Sunday	25- Feb	6	Homework 6 due (11.59 pm)
8	Tuesday	27- Feb	1,2,3,4,5,6	Review class
	Thursday	29- Feb	1,2,3,4,5,6	**Exam I**
9	Tuesday Thursday	05- March 07- March	7	Inferences Based on a Single Sample Tests of Hypotheses
March 13, 2024 4:00 PM Withdrawal Deadline				
10	Tuesday Thursday	12- March 14- March	8 7,8	Inferences Based on Two Samples Quiz 4 (in-class)
	Sunday	17- March	7,8	Homework 7 due(11.59 pm)
March 18, 2024 to March 22, 2024, Spring Break				
11	Tuesday Thursday	26- March 28- March	9	Design of Experiments and Analysis of Variance
	Sunday	31- March	9	Homework 8 due (11.59 pm)
12	Tuesday Thursday	02- April 04- April	9	Design of Experiments and Analysis of Variance
	Thursday	04- April	8,9	Quiz 5 (in class)
13	Tuesday Thursday Thursday	09- April 11- April 11- April	11 11 11	Simple Linear Regression Simple Linear Regression Quiz 6 (in-class)
	Sunday	14- April		Final project (Part II)
14	Tuesday	16- April	12	Simple Linear Regression

	Thursday	18- April	7,8,9,11,12	Exam II
15	Tuesday	23- April	12	Multiple Regression and Model Building
	Thursday	24- April	Reading Day (No exams all day)	
16	Thursday	30-April		Final Project submission due (11.59pm)