

Virginia Tech
Department of Economics
Fall 2025

ECON 3254: Applied Econometrics

Instructor: Brianna Felegi, Ph.D. (bfelegi@vt.edu)

Graduate Teaching Assistant: Reza Tavakoli (rtavakoli@vt.edu)

Class Time: Tuesdays and Thursdays, 11:00 am – 12:15 pm (Section 84701)
12:30 pm – 1:45 pm (Section 84702)

Class Location: ROB 103 for Section 84701
ROB 122 for Section 84702

Instructor Office Hour Times: Tuesdays and Thursdays in 3119 Pamplin Hall
9:30 – 10:30 am, 2:00 – 3:00 pm
Or By Appointment

TA Office Hour Times: Mondays in 3055 Pamplin Hall
10:00 – 11:30 am

Course Description and Objectives

This course intends to expose you to the statistical techniques that economists use for estimating, testing, and forecasting economic relationships. The emphasis is on understanding the techniques involved and what they mean in terms of the economic problem being studied. Successful completion of this course should allow you to (1) understand empirical literature in economics and (2) be prepared to start doing independent research using economic data, particularly in upper-level classes. This course will emphasize economic applications over statistical theory.

Through this course, you will have gained the skills necessary to be a thoughtful consumer of social science research. You will be able read and understand the output that is generated when you estimate a model. You will be able to identify and analyze the basic problems that can arise when using ordinary least squares estimation and you will be able to implement the appropriate techniques to overcome these problems. Students often find the course to be rigorous and demanding. We will move quickly and cover a large amount of material. I advise you to prepare for class and keep up with the material, as the course does not lend itself to memorization or all-night cram sessions.

Prerequisites

BIT 2405 (MIN grade of P) or MSCI 2405 (MIN grade of P), BIT 2406 (MIN grade of P) or MSCI 2406 (MIN grade of P) or STAT 3005 (MIN grade of P) or STAT 4604 (MIN grade of P) or STAT 4705 (MIN grade of P) or STAT 4714 (MIN grade of P)

Course Materials

1. “Mastering ‘Metrics: The Path from Cause to Effect”, 2015, Angrist and Pischke
2. Stata, A six-month student copy of the I/C version is sufficient ([link](#))
3. “The Effect: An Introduction to Research Design and Causality”, Nick Huntington-Klein

Statistical Software

The class will use the Stata statistical software package. Stata is a fast and versatile program that was written by economists, so it is more intuitive for people in our field. Stata is the program of choice for applied micro economists.

You can purchase a six-month student copy of Stata for \$48 at the following link:

<https://www.stata.com/order/new/edu/profplus/student-pricing/>

Stata a required resource. This software will not run on Chromebooks. The details of computer requirements for Stata can be found here:

<https://www.stata.com/products/compatible-operating-systems/>

I have programmed in Stata for years so if you have any question, please let me know. One note – in order to help you with your programming, I need to see the code. Therefore, copy the code you are working and email me the text. Too many people come to my office and say “I typed what was in the handout and it did not work” then don’t show me their code. I need to see what you are doing before I can help.

Requirements (and grading weight)

A. Participation (5%)

Students should be prepared to contribute to class discussions (answering questions, asking clarifying questions, going to office hours, pointing out mistakes on board, providing feedback to peers during group presentations). Throughout the semester, I will provide the class with some news media that is relevant to the topics of discussion. You can earn participation points by adding to the conversation about the piece and relating it to what you have learned in class.

B. Homework Assignments (15%)

Homework will involve solving problems and answering questions related to material we covered in class, as well as performing econometric analysis in Stata.

You may use the textbook, personal notes, or other reference material to do the homework. You may and are encouraged to work with your classmates. However, everyone must turn in their own work, perform their own Stata analysis, and write the answers in their own words. If homework is identical to a classmates’, you may not receive credit for the answer.

Assignments and due dates will be posted in Canvas. Homework is to be turned in by 11:59pm on the due date. You can turn in a physical copy to me in class or upload a submission in Canvas. For Stata portions of the homework, you must submit your code and output. 10 points will be taken off for each day past the due date that the homework is turned in. Once the homework solutions are posted, you cannot receive above a 40%.

In total, there are 5 problem sets. I will drop your lowest scoring homework, so only 4 will contribute to your final grade.

C. Midterms (25% each; Total 50%)

There will be two midterm exams conducted throughout the semester that are in class and are closed book. For midterms, you are allowed to bring in a single-sided 8.5 x 11-inch sheet of paper with anything on it legible to your naked eye. Both midterms will take place during the regularly scheduled class time in our usual classroom. The first midterm will be Thursday October 2nd, and the second midterm will be Thursday November 13th. There are no makeups for midterms, unless you have a documented emergency (e.g. serious injury, death of family member).

Exam Corrections

I understand that everyone has an off day and that exams don't always reflect the effort put into learning the material. If you are worried about the grade on a midterm, all students are welcomed to submit exam corrections. The process is outlined below:

- You have one week (from when exams are handed back) to re-do the exam
- You must fully write out how to solve the problem (step-by-step!) neatly
- Students cannot ask the assistance of either the teaching assistant or myself
- Students can earn up to 25% of the points back

D. Group Research Project (30%)

At the end of the second week of class, you will be put into groups for a research project. The project will require your group to develop an economic research question, find data to answer the question and perform the statistical analysis necessary to answer the question.

There will be six components of the project that will be graded.

1. Project Proposal (10%) – Each group will submit three potential research questions they wish to answer for their project. This assignment requires students to explain why the research questions are interesting, what potential data sources they can use, and how the question is related to economics.
2. Data Description and Summary Statistics (10%) – Each group will submit a 2–3-page document describing the dataset they have chosen (i.e., structure, number of observations, summary statistics of key variables of interest, etc.).

3. Regression Specification and Preliminary Results (15%) – Each group will submit a 2-3-page document describing the chosen regression model to answer the research question as well as the preliminary results.
4. Class Presentation (25%) – Each group will present their findings from their research project during a 15-minute presentation. You are required to present background information, your research question, how you answer the question (the regression model), the data you used, your results and their implications.
5. Final Report (30%) – Each group is required to hand in a 7–10-page report, that provides background information, your research question, discussion of your model, data used, presentation of your results, their implications as well as their limitations. Students are expected to incorporate the feedback from the class presentation.
6. Participation (10%) - Each group member will fill out a report that grades each members participation. Each member will receive the average grade assigned by their group members.

Group assignment of presentation day and grading rubric is provided during the semester.

E. Optional Final Exam (can replace a midterm)

The optional final exam will take place on December 13th (for section 84701) or December 15th (for section 84702) in our usual classroom unless you are informed otherwise. This final exam is optional and your grade on it will replace your lowest midterm score. You are allowed to bring an 8.5 x 11-inch sheet of paper with anything legible to your naked eye. You MUST take the exam at the scheduled date and time for your assigned section. If you happen to have too many exams in a single day (i.e. 3 exams in 24 hours) and wish to reschedule the final exam, you must contact the appropriate VT channel (presumably the Office of the Registrar) and obtain permission from the Dean’s office (Note: there is a deadline for this). If you miss the final exam and do not have an excuse from the Dean, your midterm scores will be unaffected. There will be no makeup for the final exam, unless you have a documented emergency (e.g. serious injury, death of a family member).

In summary, final grades for the course will be based on the following:

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|------------------------|-----|
| Participation | 5% |
| Homework Assignments | 15% |
| Midterms | 50% |
| Group Research Project | 30% |

Optional Final

Up to 25%

Letter grades will be assigned as follows:

| | | | |
|----|----------|----|----------|
| A | 93-100 | C+ | 77-79.99 |
| A- | 90-92.99 | C | 73-76.99 |
| B+ | 87-89.99 | C- | 70-72.99 |
| B | 83-86.99 | D | 60-69.99 |
| B- | 80-82.99 | F | 0-59.99 |

Grading Questions or Disputes

I want you to understand how you are evaluated in this class. If you have any questions about your grade or feedback on course work, please email me to schedule a time to meet. I kindly ask that you wait at least 24 hours after work has been returned before requesting an appointment. This is to give you time to more thoroughly consider questions you have about your work.

Canvas

Our website within Canvas (<https://canvas.vt.edu/>) will have the slides class, assignment information and more. Please check the website regularly for class updates.

Academic Honesty

One of the goals of this course is to prepare you to do well in advanced economics courses, so it is essential that you develop a solid understanding of the material. To that end, while collaboration on problem sets is encouraged in this course, copying is not. Students are expected to understand and abide by the University's honor code (<https://honorsystem.vt.edu/>).

Undergraduate Academic Integrity Statement

The Undergraduate Honor Code pledge that each member of the university community agrees to abide by states:

"As a Hokie, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do."

Students enrolled in this course are responsible for abiding by the undergraduate Honor Code on each assignment and/or exam. A student who has doubts about how the Honor Code applies to any assignment is responsible for obtaining specific guidance from the course instructor before submitting the assignment for evaluation. Students are strongly discouraged from misusing unauthorized online sources including generative artificial intelligence outlets. Students are strongly encouraged to consult their faculty members regarding the use of such outside materials as the misuse of these sources may constitute a violation of the Honor Code. Ignorance of the rules does

not exclude any member of the University community from the requirements and expectations of the Honor Code

Academic Accommodations

Virginia Tech welcomes students with disabilities into the University's educational programs. The University promotes efforts to provide equal access and a culture of inclusion without altering the essential elements of coursework. If you anticipate or experience academic barriers that may be due to disability, including but not limited to ADHD, chronic or temporary medical conditions, deaf or hard of hearing, learning disability, mental health, or vision impairment, please contact the Services for Students with Disabilities (SSD) office (540-231-3788, ssd@vt.edu, or visit ssd.vt.edu). If you have an SSD accommodation letter, please meet with me privately during office hours as early in the semester as possible to deliver your letter and discuss your accommodations. You must give me reasonable notice to implement your accommodations, which is generally 5 business days and 10 business days for final exams.

If there are aspects of this course that prevent you from learning or exclude you, please let me know as soon as possible. Together we'll develop strategies to meet both your needs and the requirements of the course.

Basic Needs Statement

For any student who has difficulty affording groceries, accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and if you believe this may affect your performance in this course, you are urged to contact the Dean of Students office for support at 540-231-3787 or complete an [interest form](#) to participate in The Market at Virginia Tech.

The Dean of Students, through The Market at Virginia Tech, offers food options and other resources. There is also a [Student Emergency Fund program](#). If you are comfortable in doing so, please notify me or your departmental advisor of your situation. This will enable them to provide any resources they have access to.

Lauren's Promise I will listen and believe you if someone is threatening or harassing you.

Lauren McCluskey, a 21-year-old student at the University of Utah and the daughter of economist Jill McCluskey, was murdered on October 22nd, 2018, by a man she briefly dated. I am committed to doing what I can to make sure this does not happen again.

If you are in immediate danger, call 911. If you are experiencing sexual assault, domestic violence, stalking, or harassment you can report it to me. You should be aware that I am a mandatory reporter, which means that I am required to report these instances to the university's Title IX Coordinator or Deputy Title IX Coordinator to investigate. **You can also learn about your options (both on and off-campus as well as confidential or not) at**

[ix-vawa.html](#). If you need support for your mental or emotional health for any reason, you can talk to me. You can also find helpful resources at <https://ucc.vt.edu/>.

Tentative Course Outline (Subject to Change)

| Dates | Lecture Topics | Assignments and Readings |
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| Week I: Aug. 26 th & Aug. 28 th | Introduction to Course | |
| Week II: Sep. 2 nd & Sep. 4 th | Probability and Statistics Review | A&P Appendix Mastering Inference NHK Chap. 3 Describing Variables NHK Chap. 4 Describing Relationships |
| Week III: Sep. 9 th & Sep 11 th | Randomized Control Trials Motivating Regressions | A&P Chap. 1 Randomized Trials A&P Chap. 2 Regression NHK Chap. 13 Regression Sept. 9 th – Problem Set 1 Due |
| Week IV: Sep. 16 th & Sep. 18 th | Estimating, Evaluating and Interpreting Regressions | A&P Appendix Regression Theory |
| Week V: Sep. 23 rd & Sep. 25 th | Hypothesis Testing Choosing Independent Variables | Sept. 23 rd – Research Project Proposal |
| Week VI: Sep. 30 th & Oct. 2 nd | Midterm 1 | Sept. 30 th – Problem Set 2 Due |
| Week VII: Oct. 7 th & Oct. 9 th | Choosing Functional Form Interaction Terms | |
| Week VIII: Oct. 14 th & Oct. 16 th | Potential Issues in Regression Analysis | Oct. 14 th – Descriptive Statistics Due |
| Week IX: Oct. 21 st & Oct. 23 rd | Fixed Effects | NHK Chap. 16 Fixed Effects Oct. 21 st – Problem Set 3 Due |
| Week X: Oct. 28 th & Oct. 30 th | Difference-in-Differences | A&P Chap 5. Differences-in-Differences NHK Chap. 18 Difference-in-Differences |

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| Week XI: Nov. 4 th & Nov. 6 th | Instrumental Variables | A&P Chap 3. Instrumental Variables NHK Chap. 19 Instrumental Variables Nov. 4 th – Preliminary Results Due |
| Week XII: Nov. 11 th & Nov. 13 th | Midterm 2 | Nov. 11 th – Problem Set 4 Due |
| Week XIII: Nov. 18 th & 20 th | Regression Discontinuity | A&P Chap 4. RD Designs NHK Chap. 20 Regression Discontinuity |
| Week XIV: Nov. 25 th & Nov. 27 th | No Class – Thanksgiving Break | |
| Week XV: Dec. 2 nd & Dec. 4 th | Research Project Presentations | Dec. 2 nd – Problem Set 5 Due Dec. 2 nd – Class Presentations Due |
| Week XVI: Dec. 9 th | Final Exam Review | Dec. 9 th – Final Report Due |