

## Econ 104 : Introduction to Econometrics

<b>Instructor:</b>	John Lazarev ( <a href="mailto:jlazarev@sas.upenn.edu">jlazarev@sas.upenn.edu</a> ) PCPSE, Office 633
<b>Office Hours:</b>	Wednesdays 2:00–4:00pm
<b>Lecture:</b>	Stiteler Hall B6, Tuesdays and Thursdays, 1:30–3:00pm
<b>Recitation Sessions:</b>	one hour per week as scheduled
<b>Teaching Assistants:</b>	Gorkem Bostanci ( <a href="mailto:bostanci@sas.upenn.edu">bostanci@sas.upenn.edu</a> ) Kathleen Hui ( <a href="mailto:huikat@sas.upenn.edu">huikat@sas.upenn.edu</a> ) Ruizhi Ma ( <a href="mailto:ruizhima@sas.upenn.edu">ruizhima@sas.upenn.edu</a> ) Juan Sagredo ( <a href="mailto:sagju@sas.upenn.edu">sagju@sas.upenn.edu</a> )
<b>Midterm Exam:</b>	Thursday, March 5, in class
<b>Final Exam:</b>	Thursday, May 7, 9:00–11:00am, as set by registrar

**Course Description** This course is designed to introduce students to econometric techniques and their applications in economic analysis and decision making. The main objective of the course is to train the student in (i) handling economic data; (ii) quantitative analyses of economic models with probabilistic tools; (iii) econometric techniques, their application as well as their statistical and practical interpretation; (iv) implementing these techniques on a computer.

The course focuses on practical and conceptual issues involved in the substantive applications of econometric techniques. Estimation and inference procedures are formally analyzed for simple econometric models and illustrated by empirical case studies using real-life data. The course covers linear regression models, simultaneous-equations models, discrete choice models and univariate time series models. Estimation and Inference is conducted using least squares and likelihood based techniques. Students are required to perform several econometric analyses of their own.

**Prerequisites:** ECON 101 and 103, MATH 104 and either 114 or 115 or with instructor's permission.

**Course Text:** The required textbook for this course is Stock, James and Mark Watson (2019, 4th Edition): *Introduction to Econometrics*. Prentice Hall, ISBN-13: 9780134461991. Moreover, I may post some lecture

notes on Penn Canvas. You will be responsible for all the material covered in the lectures and the recitation sessions. However, you will not be responsible for additional material contained in the textbook that is not covered in lectures or recitations.

**Statistical Software:** We will use the statistical package R via a front-end called RStudio throughout the course. Both programs are free and open source.

**Useful Supplementary Textbooks:**

- Angrist & Pischke, *Mastering Metrics: The Path from Cause to Effect*
- *Introduction to Econometrics with R*. (Online and Free) <https://www.econometrics-with-r.org/>

**Course Requirements and Grading:** You are expected to attend the lectures and your assigned recitation session. You have to attend the recitation session for which you are registered. The overall course grade is based *solely* on your performance on problem sets, class project, and exams. No extra work can be given, or additional credit assigned, to improve your grade.

- **Problem Sets [15%]:** There will be weekly problem sets, assigned during the semester. The problem sets are designed to give you the opportunity to review and enhance the material learned in class. Solutions must be submitted electronically on Penn Canvas. Each problem set will be graded on a scale from 0 to 10. Each problem set is due by 11:59pm on the due day. If you are late (even 1 minute late), Penn Canvas will not accept it. No excuses for missed assignments/deadlines will be accepted. The lowest problem set score will be dropped.
- **Class Project [15%]:** Group project (3–6 students). Requirements to be announced in February.
- **Midterm Exam [20%]:** Thursday 3/5, closed books and notes, in class.
- **Final Exam [50%]:** To be given on the date scheduled in the University Calendar for final exams, closed books and notes.

Your scores on the various assignments will be aggregated at the end of the semester and converted into a letter grade. I will not assign letter grades to individual assignments. While the grades for this course are not “curved,” I expect there to be about 30-35% A grades and 35-40% B grades.

**Missed Exams:** There will be no make-up examination for the midterm. If you do have a valid excuse (see departmental course policies below) for missing the midterm, then your Final will count 65% (meaning

that you will lose 5% of the potential exam credit). If you are excused from the final exam, then a make-up final exam is to be taken during the designated make-up week, usually at the beginning of the following semester.

**Course Absence Reporting:** You must use the Course Absence Reporting (CAR) system to communicate with me about exam absences. Since I do not take attendance during lectures, you do not need to alert me if you are unable to attend a specific lecture.

**Departmental Course Policies:** All course policies of the Economics Department apply to Econ 104 even if not explicitly listed on this syllabus. See: <https://economics.sas.upenn.edu/undergraduate/course-information/course-policies> for full details.

## Approximate Course Outline and Schedule

<b>Lecture</b>	<b>Topic</b>
1/16	Intro: Economic Questions, Data, and Econometrics
1/21	Randomized Control Trials
1/23	Simple Linear Regression: Intro
1/28	Simple Linear Regression: Intro
1/30	Simple Linear Regression: OLS estimator and its properties
2/4	Simple Linear Regression: OLS estimator and its properties
2/6	Simple Linear Regression: Inference
2/11	Simple Linear Regression: Pitfalls with time series
2/13	Multiple regression: Intro
2/18	Multiple Linear Regression: OLS estimators and its properties
2/20	Multiple Linear Regression: Inference, dummy variables, structural breaks
2/25	Multiple Linear Regression: Causal effects
2/27	Multiple Linear Regression: Control variables
3/3	Review Session
3/5	<b>Midterm Exam</b>
3/17	Multiple Linear Regression: Nonlinear regression, model selection, internal and external validity
3/19	Multiple Linear Regression: Measurement error, simultaneity bias, selection bias, time series
3/24	Panel Data
3/26	Panel Data
3/31	Binary Outcomes
4/2	Binary Outcomes
4/7	Instrumental Variables Estimation: Endogeneity bias
4/9	Instrumental Variables Estimation: Inference
4/14	Instrumental Variables Estimation: Specification test
4/16	Experiments and Quasi-Experiments
4/21	Prediction with Many Regressors and Big Data
4/23	Topics in Time Series
4/28	Review Session
5/7	<b>FINAL EXAM</b>