Quantitative Reasoning in Political Science
POL 138-001 · Summer 2025

3 credit hours. Online in Canvas. Four weeks: Mon 14 Jul 2025 to Fri 8 Aug 2025
Instructor: L.J Zigerell (ljzigerell@ilstu.edu)
Office hours in Zoom by appointment. Online Office Hours Link

How this course is set up

This POL 138 course is online asynchronous using Canvas. See the final page of this syllabus for a course schedule. Each weekday has learning activities and a recommended submission of assessments, but, to provide students more flexibility, assessments recommended for Monday through Tuesday will be due Wednesday, and assessments recommended for Wednesday and Friday will be due Friday. **Students are strongly recommended to not plan to start and complete assessments only on the due dates.** Research indicates that students on average learn more when material is spaced over time, so we will avoid having all assessments due on Fridays.

Course notes are across 16 chapters. For each chapter, students are assigned:

- to read the chapter in the course notes at https://www.ljzigerell.com/pol138summer2025/ and/or to watch the corresponding chapter video, if available, at https://www.youtube.com/playlist?list=PLpOLDcSVWDdnOaBuwfGnb0ZvZVzd8zWt3
- and to submit in Canvas the assignments for that chapter by the due date.

Each week also has an exam, including a cumulative two-part final exam, with the first part multiple-choice items and the second part open-ended items that students are assigned to handwrite. Practice exams and keys are available, but practice exams are not required to be submitted and are not graded. Most assessments for a week should be available in Canvas by the Monday of the week, so that students can work ahead. Assessments will hopefully be graded within a day of submission during the work week: multiple-choice items should autograde, but I need to grade short-answer items myself. At least one bonus assignment will be available.

Help with course material

Students who would like more help understanding course material are encouraged to email the instructor questions or to request a meeting in Zoom. If requesting a meeting, please provide dates and times when you are available to meet. If a list of questions emailed to the instructor might require an extensive response, the instructor might request a Zoom meeting to answer the questions. **If you need a particular grade for this course, the time to tell the instructor about this is as soon as possible.**

Major course-level learning outcomes

1. Know how to make correct inferences from data.
2. Know how to identify incorrect inferences from data.
3. Improve understanding of how to use Microsoft Excel for data analysis.

Course catalog description
Uses a classroom laboratory approach to develop skills in statistical reasoning and method.

Prerequisites and required technology

Required textbooks	No required textbook(s)
Prerequisite courses	None
Prerequisite knowledge	High school math skills and English language ability
Required technology	Paper, pen/pencil, access to the internet, Microsoft Word and Microsoft Excel (at 365.ilstu.edu if needed), a PDF reader, the statistical program R (available on campus computers and through websites such as WebR), technology to make a video, technology to take a photo or scan a paper, and technology to combine photos or scans into a single PDF

Academic honesty rules
Below are the course rules about academic honesty. Any violation of these rules might result in a failing grade or other sanctions as permitted by university policy.

1. **For any assignment item or exam item for this course, students are not permitted to use other persons or artificial intelligence such as ChatGPT to generate a response or to help generate a response.**

2. **For this course, students are permitted to use other persons and/or artificial intelligence to help understand material, by using more general prompts that are not about specific assignment items or exam items. So, for example, students would be permitted to ask artificial intelligence to "Explain p-values to me", but students would not be permitted to ask artificial intelligence to answer an assignment or exam item such as "If we flipped a coin and got 10 heads and 10 tails, what would be the p-value for a statistical test of the null hypothesis that the coin is fair?".**

3. **For any assignment item or exam item for this course, students are permitted to use a calculator, Microsoft Excel or similar statistical software, online course notes, online course videos, the student's handwritten or typed notes, and other hard copy or electronic materials or internet sites other than artificial intelligence such as ChatGPT that can generate a response to prompts.**

Technical issues
Feel free to email me regarding technology issues. If I can't solve the issue, please report the issue at https://help.illinoisstate.edu/get-it-help and include "Summer Session" as the subject line.

Course grades

Final course grades will reflect student performance on these assessments:

#	Assessment	% of final grade
1	Assignments	40
2	Exam 1	12
3	Exam 2	12
4	Exam 3	12
5	Cumulative final exam	24

The course grading scale is: 90.000 and above → A; 80.000 to 89.999 → B; 70.000 to 79.999 → C; 60.000 to 69.999 → D; and less than 60.000 → F.

Missed assessments

For submitting assessments, feel free to contact me if you need an accommodation or an extension. However, submissions will not be accepted late unless the lateness is due to an approved reason. The instructor reserves the right to request documentation before crediting an assessment submitted late.

If an assessment is submitted more than one week after its original due date, the justification for a late submission must also include a valid reason for the extra delay.

Moreover, absent an incredibly strong justification, makeup work will not be accepted for credit for a student after that student's final exam has been submitted; this incredibly strong justification cannot be to improve the student's grade.

Notes

1. For communication about this course, please use one email thread, unless there is a good reason not to; that makes it easier for me to see our past messages. Feel free to follow up if I do not respond to an email within 24 hours during the week.

2. Requests for individual extra credit assignments will not be granted.

3. Please alert me to any errors in course materials. Feel free to send me comments and/or suggestions about the course.

4. Course policies might be revised in reflection of student feedback or for other reasons.

Mandated reporting

Please be aware that the instructor is required by law to report certain information that is communicated to the instructor or that the instructor otherwise becomes aware of. See https://security.illinoisstate.edu/report/crime_reporting/faq.php.

Accommodations

Per the standard Illinois State University course statement:

> Any student needing to arrange a reasonable accommodation for a documented disability and/or medical/mental health condition should contact Student Access and Accommodation Services at 308 Fell Hall, Office Phone (309) 438-5853, Video Phone (309) 319-7682 or visit the website at StudentAccess.IllinoisState.edu

Mental health resources

Per the Student Counseling Services syllabus statement:

> Life at college can get very complicated. Students sometimes feel overwhelmed, lost, experience anxiety or depression, struggle with relationship difficulties or diminished self-esteem. However, many of these issues can be effectively addressed with a little help. Student Counseling Services (SCS) helps students cope with difficult emotions and life stressors. Student Counseling Services is staffed by experienced, professional psychologists and counselors, who are attuned to the needs of college students. The services are FREE and completely confidential. Find out more at counseling.illinoisstate.edu or by calling (309) 438-3655.

Student bereavement policy

Per suggested syllabus language reflecting the student bereavement policy:

> Students who experience the death of an immediate family member or relative as defined in the University Student Bereavement Policy will be excused from class for funeral leave, subsequent bereavement, and/or travel considerations. Students are responsible for providing appropriate documentation to the Dean of Students office and for contacting the instructor as soon as possible to make arrangements for completing missed work. More information is available in the Student Bereavement Policy.

General education learning outcomes for the course

GenEd learning outcomes (from General Education at Illinois State University) for this course:

> II. Intellectual and practical skills, allowing students to
> - Make informed judgments
> - Analyze data to examine research questions and test hypotheses
> - Report information effectively and responsibly
>
> IV. Integrative and applied learning, allowing students to
> - Identify and solve problems
> - Transfer learning to novel situations

Course topics

1 Basic tools of quantitative reasoning
- 1.1 Quantitative reasoning
- 1.2 Measures of central tendency
- 1.3 Outliers
- 1.4 Standard deviation
- 1.5 Histograms
- 1.6 Proportions, percentages, and percentage points
- 1.7 Percentiles
- 1.8 Weighted means

2 Sampling
- 2.1 Sampling error
- 2.2 Law of Large Numbers
- 2.3 Imbalanced sample sizes
- 2.4 Relatively small samples can be useful
- 2.5 Sampling weights
- 2.6 The normal distribution
- 2.7 Confidence intervals
- 2.8 Margin of error

3 p-values
- 3.1 The null hypothesis
- 3.2 p-values
- 3.3 Estimating p-values
- 3.4 p-values if the null hypothesis is true
- 3.5 p-values if the null hypothesis is not true
- 3.6 Hypothesis testing
- 3.7 Selecting a p-value threshold
- 3.8 Statistical and substantive significance
- 3.9 Hypothesis tests involving random sampling
- 3.10 Caution about p-values for causal inference

4 Linear regression
- 4.1 Linear regression line of best fit using OLS
- 4.2 Simple linear regression
- 4.3 Drawing the line of best fit
- 4.4 Linear regression with categorical predictors

5 Alternate explanations
- 5.1 Correlations
- 5.2 Alternate explanations

6 Randomized experiments
- 6.1 Randomized experiments
- 6.2 Placebos
- 6.3 Natural experiments

7 Non-random comparisons
- 7.1 Discontinuity designs
- 7.2 Difference-in-differences
- 7.3 Benchmarks
- 7.4 Panel designs

8 Statistical control
- 8.1 Statistical control
- 8.2 Multiple linear regression
- 8.3 Illustration of the effects of statistical control

9 Imperfect indicators of quality
- 9.1 Peer review
- 9.2 Pre-registration
- 9.3 Meta-analysis

10 Threats to inference 1
- 10.1 Selection bias
- 10.2 Per capita
- 10.3 Influential outliers
- 10.4 Using a less relevant measure
- 10.5 Measurement error
- 10.6 Restriction of range
- 10.7 Confounders
- 10.8 Miscontrolling
- 10.9 Reverse and reciprocal causality

11 Threats to Inference 2
- 11.1 Misinterpreting $p>0.05$
- 11.2 Misinterpreting differences in statistical significance

Course schedule

Date	Learning activities	Recommended submission date	Required submission date
M Jul 14	Review the syllabus Read/watch Chapter 01	A00 Syllabus A01a + A01b	---
T Jul 15	Read/watch Chapter 02	A02a + A02b	---
W Jul 16	Read/watch Chapter 03	A03a + A03b	A00 Syllabus A01a + A01b A02a + A02b
R Jul 17	Read/watch Chapter 04	A04a + A04b	---
F Jul 18	Do Practice Exam 1 and check the key	Exam 1	A03a + A03b A04a + A04b Exam 1
M Jul 21	Read/watch Chapter 05	A05a + A05b	---
T Jul 22	Read/watch Chapter 06	A06a + A06b	---
W Jul 23	Read/watch Chapter 07	A07a + A07b	A05a + A05b A06a + A06b
R Jul 24	Read/watch Chapter 08	A08a + A08b	---
F Jul 25	Do Practice Exam 2 and check the key	Exam 2	A07a + A07b A08a + A08b Exam 2
M Jul 28	Read/watch Chapter 09	A09a + A09b	---
T Jul 29	Read/watch Chapter 10	A10a + A10b	---
W Jul 30	Read/watch Chapter 11	A11a + A11b	A09a + A09b A10a + A10b
R Jul 31	Read/watch Chapter 12	A12	---
F Aug 1	Do Practice Exam 3 and check the key	Exam 3	A11a + A11b A12 Exam 3
M Aug 4	Read Chapter 13 Read/watch Chapter 14	A13 A14a + A14b	---
T Aug 5	Read/watch Chapter 15	A15	---
W Aug 6	Read/watch Chapter 16 Do the Practice Final Exam and check the key	---	A13 A14a + A14b A15
R Aug 7	---	Final Exam MC	---
F Aug 8	---	Final Exam SA A16 Video	Final Exam MC Final Exam SA A16 Video