POLI:5001:0001 Introductory Methodology
Tues & Thurs 11:00am – 12:15pm
Wed 5:30–6:20pm
3 Schaeffer Hall
Fall 2020

Course Information

Instructor: Elizabeth Menninga
Office: 311 SH (and Zoom)
Office Hours: Tues 1-3pm; Weds 2-3pm
    Note: See ICON for more details about office hours this Fall!
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Class Website: `icon.uiowa.edu`

Course Description

This course is an introduction to statistical analysis, the second in our four-course research methods sequence. The purpose of the class is to (1) provide you with an understanding of some of the concepts that underlie statistical analysis, (2) introduce you to some basic statistical techniques, (3) learn basic math skills for social scientists and (4) develop your own capacity to do quantitative analysis. We will cover a broad range of topics including descriptive statistics, probability distributions, sampling distributions, point and interval estimation, hypothesis testing, and regression analysis.

The lab section of the class will cover basic math for social scientists, including algebra, limits and continuity, differential and integral calculus, and matrix algebra. The lab sessions will also introduce students to STATA. The technology teaching assistant for the department, Yufan Yang, will run the STATA sessions. All lab readings are optional/resource for the future when you run into these topics again.

Course Materials

In this course, we will use a variety of in-print and on-line resources. The following book is required:

- Gailmard, Sean. 2014. *Statistical Modeling and Inference for Social Science*. Cambridge University Press

The required Gailmard book does many things very well. In particular I believe it to be a good reference for you in the future as you move through your careers as political scientists. I look things up in it still to this day. It gives a succinct, thorough, and precise treatment of key concepts. That said, it has limited worked out examples and illustrations. For those of you who would find more hands-on illustrations and worked through examples, I recommend the following text available on-line through OpenStax for free.

- Illowsky, Barbara & Susan Dean. Introductory Statistics. OpenStax

Also, I *strongly* recommend one of the following for key math concepts you'll run into throughout your career as a political scientist. Kropko provides more examples and is better for students who have never learned calculus or matrix algebra. Moore & Siegel is a good refresher for students who have familiarity with those concepts.

- Kropko, Jonathan. 2016. *Mathematics for Social Scientists*. Sage Publications.

- Moore, Will H. and David A. Siegel. 2013. *A Mathematics Course for Political & Social Research*. Princeton, NJ: Princeton University Press.

Any other readings assigned will be available on the class ICON site.

Software

We will be using Stata for a few assignments later in the semester. Stata is available via the UIowa Virtual Desktop as well as in the collab. Note for Fall 2020: you should be able to remote desktop into the collab computers to use the software available on those computers from home. (Fall 2020 NOTE: you should be able to remote desktop into the collab this semester so you can use the software on these computers from home.) While you can purchase a license, these alternatives should suffice for this semester. The Collab TA, Yufan Yang, is available to help you with questions throughout the semester but especially related to accessing and using Stata. Email Yufan at yufan-yang@uiowa.edu to schedule a Zoom appointment. If you have computing questions, you can (and should!) take advantage of Yufan's help and expertise.

Course Requirements and Grading

Your grade for the course will be determined by performance in two areas: problem sets and exams. I abide by the standard grading scheme with + and - grades given. Grades of an A+ is a very rarely given grade only earned through truly exceptional performance in the course.

Course Grade Breakdown:

- Problem Sets: 30%

- Midterm Exam: 30%

- Final Exam: 40%

Problem Sets: Every week or every-other week I will post an assignment on ICON. You will have at least a week to complete each assignment. All assignments are due at the beginning of class on the due date. If you cannot make it to class on the due date, you may put it in my mailbox before the deadline or scan your answers and submit them via email.

You are welcome to work together on these assignments, but you are each expected to write up and turn in your own answers. If you do not understand the problem sets, you will not do well on the exams. Therefore copying someone else's work not only constitutes academic dishonesty, but it will also hurt you on the exams.

Working together is difficult while also trying to social distance. If I can facilitate study groups in any way, please just let me know. If you prefer virtual groups, Zoom has a "white board" setting where you can can draw/write (this works best if you have a touch screen and works great on tablets in my experience). I also have a small portable white board you are welcome to borrow if you want to do outdoor study sessions. Feel free to be creative and let me know if I can help.

Late homework will be accepted but will be penalized. Any late homework will have points deducted at the rate of 10% of the total available points per calendar day unless arrangements are made *prior* to the due date. Answer keys will be posted when an assignment is returned. Once the answer key is posted, late homework will no longer be accepted.

Midterm Exam: The midterm will be an in-class, closed-note exam. Each student is expected to work independently and not receive any outside assistance on the exam. Only a calculator and equation sheet are allowed (and strongly encouraged) as aids during the exam. NOTE: your calculator can not be your phone. A very basic calculator is sufficient.

Final Exam: The final exam will be given in two parts. Before Thanksgiving break the "Definitions & Short Answer" section of the exam will be given in-class. This section will be closed note. During finals week the computation and interpretation sections will be given. Because of the on-line nature of the final this Fall, this portion of the exam will be open note/book. You will have limited time and have to **show your work** to receive credit. While you can use your class notes/books, you are expected to work independently. Consulting with other people will constitute academic dishonesty.

Important Dates

- Midterm Exam: Thursday, October 15 (in-class)

- Final Exam Part I: Thursday, November 19 (in-class)

- Final Exam Part II: TBD (at home)

Other Expectations

Communication: Communicate with all of your instructors! But in particular for this course, do not hesitate to contact me if you have concerns. As the material builds upon itself, confusion early in the semester will only get worse as the semester unfolds. This fall in particular, please do not hesitate to reach out if you have any questions or concerns about the semester than I can help with.

Attendance: (Added for Fall 2020) I fully appreciate that there are a myriad of reasons a student might miss class this Fall. Attendance has never been a part of the grade for this course (and that hasn't changed), but missing classes does mean missing material that will be on the assignments and exams. Please communicate with me as soon as you know you will be absent. Depending on the circumstances, we can discuss strategies to help you keep up with the material without being in the classroom.

Technology: Please turn your mobile phones off or to silent mode before class. Laptops are permitted for class purposes only. If you are using your laptops for notes or readings, sign out of everything else so you can focus on mastering the material at hand. There are days in which we will be using statistical software in class. I will give you advanced warning so you can bring your laptops on those days if you wish.

Email: Email is a useful way to ask quick questions. However, replying to complicated questions is highly inefficient for both you and me. If you want to talk about something you don't understand, come by my office hours or ask for a (Zoom) meeting. In general, while I respond to student emails, I prefer to talk in person. Come see me during office hours or ask for an appointment!

Ask Questions! Often if you have a question one of your classmates does too. Relevant questions are strongly encouraged.

Slow Me Down! I talk fast. This is true. I try very hard to slow down in class and to be aware of it. But, I don't always catch myself in time. Please feel free to interrupt and ask me to repeat myself or slow down at any time. Especially this fall while wearing a face mask, don't hesitate to speak up if you could use something being repeated!

UI and the College of Liberal Arts and Sciences
Information for Students

Absences and Attendance: Students are responsible for attending class and for contributing to the learning environment of a course. Students are also responsible for knowing their course absence policies, which will vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, including Holy Day obligations, military service obligations, unavoidable circumstances or University authorized activities Students may use the CLAS absence form to aid communication with the instructor who will decide if the absence is excused or unexcused. The form is on ICON in the top banner under "Student Tools." More information is at `https://clas.uiowa.edu/students/handbook/attendance-absences`.

Academic Integrity: All undergraduates enrolled in courses offered by CLAS have, in essence, agreed to the College's Code of Academic Honesty. Misconduct is reported to the College, resulting in suspension or other sanctions communicated to the student through the UI email address (`https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code`).

Accommodations for Disabilities: UI is committed to an educational experience that is accessible to all students. A student may request academic accommodations for a disability (such as mental health, attention, learning, vision, and physical or health-related condition) by registering with Student Disability Services (SDS). The student is then responsible for discussing specific accommodations with the instructor. More information is at `https://sds.studentlife.uiowa.edu/`.

Administrative Home of the Course: The College of Liberal Arts and Sciences (CLAS) is the administrative home of this course and governs its add/drop deadlines, the second-grade-only option, and related policies. Other colleges may have different policies. CLAS policies may be found here: `https://clas.uiowa.edu/students/handbook`.

Class Behavioral Expectations: Students are expected to comply with University policies regarding appropriate classroom behavior as outlined in the Code of Student Life. This includes the policies and procedures that all students have agreed to regarding the Steps Forward for Fall 2020 in response to the COVID-19 pandemic. Particularly, all students are required to wear a face covering when in a UI building, including a classroom. In addition, the density of seats in classrooms has been reduced; in some instances, this will allow 6 feet or more between students while other cases, it may be less. Regardless, wearing a face covering and maintaining as much distance as possible are vital to slowing the spread of COVID-19. In the event that a student disrupts the classroom environment through their failure to comply with the reasonable directive of an instructor or the University, the instructor has the authority to ask that the student immediately leave the space for the remainder of the class period. Additionally, the instructor is asked to report the incident to the Office of Student Accountability for the possibility of additional follow-up. Students who need a temporary alternative learning arrangement related to COVID-19 expectations should contact Student Disability Services arrangements (+1 319 335-1462; `https://sds.studentlife.uiowa.edu/fall-2020/covid-19-temporary-learning-arrangements/`).

Class Recordings: Privacy and Sharing: Some sessions of a course could be recorded or live-streamed. Such a recording or streaming will only be available to students registered for the course. These recordings are the intellectual property of the faculty, and they may not be shared or reproduced without the explicit written consent of the faculty member. Students may not share these sessions with those not in the class; likewise, students may not upload recordings to any other online environment. Doing so is a breach of the Code of Student Conduct and, in some cases, a violation of the Federal Education Rights and Privacy Act (FERPA).

Communication and the Required Use of UI Email: Students are responsible for official correspondences sent to the UI email address (uiowa.edu) and must use this address for all communication within UI (Operations Manual, III.15.2).

Complaints: Students with a complaint about an academic issue should first visit with the instructor or course supervisor and then with the Chair of the department or program offering the course; students may next bring the issue to the College of Liberal Arts and Sciences; see this page for more information: `https://clas.uiowa.edu/students/handbook/student-rights-responsibilities`.

Final Examination Policies: The final exam schedule is announced around the fifth week of classes; students are responsible for knowing the date, time, and place of a final exam. Students should not make travel plans until knowing this information. No exams of any kind are allowed the week before finals. No exams of any kind are allowed the week before finals with very few exceptions made (for labs, ESL and some world language courses, and off-cycle courses): `https://registrar.uiowa.edu/final-examination-scheduling-policies`.

Nondiscrimination in the Classroom: UI is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited in MyUI to optionally share the names and pronouns they would like their instructors and advisors to use to address them. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the Universitys Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity (`https://diversity.uiowa.edu/eod`; +1 319 335-0705 or `diversity.uiowa.edu`).

Sexual Harassment: Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community must uphold the UI mission and contribute to a safe environment that enhances learning. Incidents of sexual harassment must be reported immediately. For assistance, please see `https://osmrc.uiowa.edu/`.

Course Outline[1]

Often only selections from the listed chapter are assigned; pay attention to the page numbers.

Anything under the header "Additional Resources" is optional reading for students who need more examples or a different approach. The goal is not for you to read all the additional readings, but rather to find a source that works for you and then know where in that source to look as we move through the course.

NOTE: After Thanksgiving all classes are going on-line. The plan is to do synchronous classes via Zoom at the regularly scheduled class time. If this plan changes, the change will be announced via ICON Announcements. If you have any questions/concerns about these on-line classes, please let me know.

Introduction to Statistics

August 25: Introduction

- Textbook:
    Gailmard, Chapter 1

August 27 & September 1: Data & Descriptive Statistics

- Textbook:
    Gailmard, Chapter 2, pp. 12-38
- Additional Resources:
    Illowsky & Dean, Chapter 1, pp. 10-16, 27-32; Chapter 2
    Kropko, Chapter 3.1-3.4

Probability

September 3: Introduction to Probability: Definitions & Axioms

- Textbook:
    Gailmard, Chapter 4, pp. 83-90
- Additional Resources:
    Illowsky & Dean, Chapter 3
    Kropko, Chapter 3.1-3.4
    Moore & Siegel, Chapter 9.1-9.2.2

September 8: Bayes' Rule & Conditional Probability

- Textbook:
    Gailmard, Chapter 4, pp. 90-98
- Additional Resources:
    Illowsky & Dean, Chapter 3 (again)
    Kropko, Section 3.5 & 3.6
    Moore & Siegel, Chapter 9.2.3

Distributions

September 10 & 15: Probability & Categorical Data

- Textbook:
    Gailmard, Chapter 4, pp. 98-106

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[1]I reserve the right to make changes with respect to topics and pacing, but will try to stick to the schedule as much as possible. You will be notified of major changes through e-mail as well as an updated schedule posted to the course website.

– Additional Resources:

   Illowsky & Dean, Chapter 4.1-4.3

   Moore & Siegel, Chapter 10.1-10.5

September 17 & 22: Discrete Probability Distributions: Moments & Joint Distributions

– Textbook:

   Gailmard, Chapter 4, pp. 106-114

   Gailmard, Chapter 5

– Additional Resources:

   Moore & Siegel, Chapter 10.7

September 24 & 29: Continuous Probability Distributions

– Textbook:

   Gailmard, Chapter 4, pp. 98-114

   Gailmard, Chapter 5, pp. 116-132 (again)

– Additional Resources:

   Illowsky & Dean, Chapter 5.1-5.2

   Moore & Siegel, Chapter 11.1-11.2

October 1 & 6: Types of Distributions & Picking the Right One

– Textbook:

   Gailmard, Chapter 6 pp. 137-166, 172-185

– Additional Resources:

   Illowsky & Dean, Chapter 4.4-4.8; 5.3-5.4

   Moore & Siegel, Chapters 10.6 & 11.3

October 8: Models & Inference for Binary Response Variables (If time. This lecture often gets skipped, but I always hope we'll have time for it!)

– Textbook:

   Gailmard, Chapter 6.2

– On ICON:

   Lindsey, Chapter 2, pp. 60-84

October 13: Midterm Review

– Bring questions!

October 15: **Midterm Exam**

Sampling & Uncertainty

October 20: Sampling (Validity, Reliability, I.I.D.)

– Textbook:

   Gailmard, Sections 3.2, 7.1

– Additional Resources:

   Illowsky & Dean, Chapter 1.1-1.2

October 22: Point Estimation

– Textbook:

   Gailmard, Sections 9.2, 7.1-7.3

- Additional Resources:
    Illowsky & Dean, Chapter 7

October 27: Confidence Intervals

- Textbook:
    Gailmard, Section 7.4.1, 7.6.1, 9.1
- Additional Resources:
    Illowsky & Dean, Chapter 8

October 29: Bootstrapping & Jackknifing

- Textbook:
    Gailmard, Section 7.7.1
- Additional Resources:
    See Readings on ICON

Hypothesis Testing & Inference

November 3: Hypothesis Testing & Statistical Inference

- Textbook:
    Gailmard, Sections 8.1-8.3
- Additional Resources:
    Illowsky & Dean, Chapter 9 & 10

November 5: Discussion of p-values & Alternatives to NHST

- See readings on ICON

November 10: Analysis of Variance

- Textbook:
    Gailmard, Section 8.4.2
- Additional Resources:
    Illowsky & Dean, Chapter 13

November 12: **No Class (Virtual) Peace Science**

November 17: χ^2 & Measures of Association

- Textbook:
    Gailmard, Section 8.7.1
- Additional Resources:
    Illowsky & Dean, Chapter 11

November 19: **Definitions & Short Answer Exam**

November 24 & 26: **No Class, Thanksgiving break**

December 1: Measures of Association & Non-parametric Tests

- Textbook:
    Gailmard, Sections 8.7

Regression

December 3: Bivariate Regression

- Textbook:
    Gailmard, Sections 2.3.5, 7.5, & 8.5
- Additional Resources:
    Illowsky & Dean, Chapter 12

December 8: Multiple Regression & Regression Extensions

- Textbook:
    Gailmard, Section 2.3.6, 7.5.3
- Additional Resources:
    Illowsky & Dean, Chapter 12 (again)

December 10: Final Exam Review

- Bring questions!

TBD: **FINAL EXAM**

Lab Sessions Calendar

August 26: Review Algebra, Sets, & Functions

- Kropko, Introduction pp. xiii, Chapters 1 & 2
- Moore & Siegel, Chapters 1 (esp. 1.2-1.4 & 1.6-1.7), 2 & 3

September 2: Limits & Continuity

- Kropko, Chapter 4.1-4.5
- Moore & Siegel, Chapter 4

September 9: Differential Calculus

- Kropko, Chapter 4.6-4.9
- Moore & Siegel, Chapters 5 & 6

September 16: Integral Calculus

- Kropko, Chapter 6
- Moore & Siegel, Chapter 7

September 23: Multivariate Calculus

- Kropko, Chapter 7.1-7.3.2, 7.4-7.4.3
- Moore & Siegel, Chapters 15, 16

September 30: Finding Maxima and Minima

- Kropko, Chapters 5, 7.3.3
- Moore & Siegel, Chapter 8

October 7 & 14: Linear Algebra

- Kropko Chapters 8, 9, & 10.1-10.3
- Moore & Siegel, Chapter 12 & 13

October 21: Intro to the Normal Distribution

- Gailmard Chapter 6.6
- Illowsky & Dean Chapter 6

October 28, November 4 & 11: STATA Tutorial

November 18: Eigenvalues & Markov Chains

- Kropko, Chapter 10.4-10.5
- Moore & Siegel, Chapter 14

November 25: **Thanksgiving Break**

December 2: Markov Chains & Simulation based inference

December 9: Catch up & Review for Final