POLI:5001:0001 Introductory Methodology
Tues & Thurs 11:00am – 12:15 pm
Wed 5:30–6:20 pm
176 Schaeffer Hall
Fall 2018

Course Information

Instructor: Prof. Menninga
Office: 311 SH
Office Hours: Mon 9:00–11:00 am, Wed 4:00–5:00pm, or by appointment
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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 is scheduled on Wednesdays from 5:30–6:20 pm in 176 SH. The labs will cover basic math for social scientists, including algebra, limits and continuity, differential calculus, partial derivatives, integral calculus, and matrix algebra. The lab sessions will also introduce students to STATA. The technology teaching assistant for the department, Christopher Junk, will be running the STATA sessions.

Course Materials

In this course, we will use a variety of in-print and on-line resources. The following books are required for the course.

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

- One of the following:

    - 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.

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. 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. It is easily available through Amazon for fairly cheap. Note the 9th edition is not the most current, but that's part of what keeps it cheap.

- Weiss, Neil A. *Introductory Statistics, 9th Edition*. Addison-Wesley.

The following book is recommended for a few topics. You can purchase the book if you like, or more pragmatically borrow copies from more senior students. The most important parts of the book will be available on ICON.

- Lindsey, J.K. 2004. *Introduction to Applied Statistics: A Modelling Approach (2nd Edition)*. Oxford University Press.

Any other readings assigned will be available through the UIowa library or 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. While you can purchase a license, these alternatives should suffice for this semester.

The Collab TA, Christopher, has office hours on Tuesday and Thursday 9:00am-1:30pm, and by appointment. If you have computing questions, you can (and should!) take advantage of this additional resource.

Course Requirements and Grading

Your grade for the course will be determined by performance in two areas: homework assignments 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:

- Homework Assignments: 30%

- Midterm Exam: 30%

- Final Exam: 40%

Homework: Every week or every-other week I will post a homework assignment on ICON before class. You will have at least a week to complete each assignment. All assignments are due at the beginning of class on the due date. 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 homeworks, 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.

Late homework will be accepted but will also 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.

Exams: Both the midterm and final will be in-class, closed-note exams. Each student is expected to work independently and not receive any outside assistance on the exams. The final exam may include interpretation or discussion of Stata output but will not require the use of Stata. Only a calculator and equation sheet are allowed (and strongly encouraged) as aids during exams.

Important Dates

- Midterm Exam: Tuesday, October 9

- Final Exam: TBD

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.

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 (typically through e-mail) 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. In general,

while I respond to student emails, I prefer to talk in person. Come see me during office hours!

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

College of Liberal Arts and Sciences (CLAS) Information and Policies

Administrative Home: 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 other policies. These policies vary by college `http://clas.uiowa.edu/students/handbook`.

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

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 should then discuss accommodations with the course instructor (`http://sds.studentlife.uiowa.edu/`).

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 to optionally share their preferred names and pronouns with their instructors and classmates. 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 (`diversity.uiowa.edu`).

Academic Integrity: All students 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`).

CLAS Final Examination Policies: The final exam schedule for each semester 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 final exam information. No exams of any kind are allowed the week before finals (`https://clas.uiowa.edu/faculty/teaching-policiesresources-examination-policies`).

Making a Complaint: Students with a suggestion or complaint should first visit with the instructor or course supervisor and then with the departmental executive officer (DEO), also known as the Chiar (Wenfang Tang, 335-2358). Students may then bring the concern to CLAS (`https://clas.uiowa.edu/students/handbook/student-rights-responsibilities`).

Understanding 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, definitions, and the full University policy (`https://osmrc.uiowa.edu`.

Technology Support through the Political Science Collaboratory: The Political Science Collaboratory is located in 334 Schaeffer Hall (SH). The Political Science Technology TA, currently Christopher Junk, has an office in the Collaboratory and is available to consult with students in Political Science courses regarding technology that may be required for their homework or research projects. This might include tips on accessing or entering data, doing basic statistical analysis, or working with computers in other ways.

Course Outline[1]

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

Introduction to Statistics

Tuesday, August 21: Introduction

- Textbook:
    Gailmard, Chapter 1

Thursday, August 23: Data, Descriptive Statistics, & Data Visualization

- Textbook:
    Gailmard, Chapter 2, pp. 12-38
- Additional Resources:
    Weiss, Chapters 2 & 3
    Lindsey, Chapter 1, pp. 1-19

Probability

Tuesday, August 28: Introduction to Probability

- Textbook:
    Gailmard, Chapter 4, pp. 83-96
- Additional Resources:
    Kropko, Chapter 3
    Moore & Siegel, Chapter 9
    Weiss, Chapter 4.1-4.6

Thursday, August 30: Bayes' Rule & Conditional Probability

- Textbook:
    Gailmard, Chapter 4, pp. 96-98
- Additional Resources:
    Kropko, Section 3.6
    Weiss, Chapter 4.7-4.8

Tuesday, September 4: Probability & Categorical Data

- See ICON for:
    Lindsey, Chapter 1, pp. 19-33 & Chapter 2 pp. 47-60

Distributions

Thursday, September 6: Discrete Probability Distributions: One Random Variable

- Textbook:
    Gailmard, Chapter 4, pp. 98-106 & Chapter 5, pp. 116-124
- Additional Resources:
    Moore & Siegel, Chapter 10, pp. 198-218
    Weiss, Chapter 5

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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 any changes through e-mail as well as an updated schedule posted to the course website.

Tuesday, September 11: Discrete Probability Distributions: Two Random Variables

- Textbook:
    Gailmard, Chapter 2, pp. 40-43
    Gailmard, Chapter 4, pp. 106-114
    Gailmard, Chapter 5, pp. 124-132
- Additional Resources:
    Moore & Siegel, Chapter 10, pp. 218-238
    Weiss, Parts of Chapter 4 & 5 are relevant again here

Thursday, September 13: Continuous Probability Distributions

- Textbook:
    Gailmard, Chapter 4, pp. 98-106
    Gailmard, Chapter 5, pp. 116-124
- Additional Resources:
    Moore & Siegel, Chapter 11, pp. 242-257

September 18 & 20 : Continuous Probability Distributions (cont.)

- Textbook:
    Gailmard, Chapter 2, pp. 40-43
    Gailmard, Chapter 4, pp. 106-114
    Gailmard, Chapter 5, pp. 124-132
- Additional Resources:
    Moore & Siegel, Chapter 11, pp. 257-270

September 25 & 27: Types of Distributions & Picking the Right One

- Textbook:
    Gailmard, Chapters 3 & 6 pp. 137-166, 172-185
- Additional Resources:
    Lindsey, Chapter 4, pp. 173-225
    Weiss, Chapter 6 (Only focuses on the Normal Distribution)

Tuesday, October 2: Models & Inference for Binary Response Variables

- Textbook:
    Lindsey, Chapter 2, pp. 60-84
    Gailmard, Chapter 6, pp. 142-151
- Additional Resources:
    Lindsey, Chapter 3, pp. 109-124

Thursday, October 4: **Review Problems & Catch Up**

Tuesday, October 9: **Midterm Exam**

- Bring questions!

Sampling & Uncertainty

Thursday, October 11: Sampling (Validity, Reliability, I.I.D.)

- Textbook:
    Gailmard, Sections 3.2, 7.1-7.4
- Additional Resources:
    Weiss, Chapter 1

Tuesday, October 16: Point Estimation

- Textbook:
    Gailmard, Sections 9.2, revisit 7.1-7.4
- Additional Resources:
    Weiss, Chapter 8.1

Thursday, October 18: Confidence Intervals

- Textbook:
    Gailmard, Section 7.6, 9.1
- Additional Resources:
    Weiss, Sections 8.2-8.4, 12.1

Tuesday, October 23: Bootstrapping & Jackknifing

- See Readings on ICON

Hypothesis Testing & Inference

Thursday, October 25: Hypothesis Testing & Statistical Inference

- Textbook:
    Gailmard, Sections 8.1-8.2
- Additional Resources:
    Weiss, Chapter 9.1-9.5, 12.2

Tuesday, October 30: Discussion of p-values & Alternatives to NHST

- See readings on ICON

Thursday, November 1: Analysis of Variance

- Textbook:
    Gailmard, Section 8.4.2
- Additional Resources:
    Lindsey, Chapter 5, 247-261
    Weiss, Sections 14.1, & 16.1-16.3

Tuesday, November 6: ^{2} & Measures of Association

- Textbook:
    Gailmard, Section 8.7
- Additional Resources:
    Weiss, Sections 13.1, 13.3, & 13.4

Thursday, November 8: **No Class Peace Science**

Tuesday, November 13: **Correlation**

Regression

Thursday, November 15: Non-parametric Tests & Bivariate Regression

- Textbook:
  Gailmard, Sections 2.3.5 & 8.5-8.6
- Additional Resources:
  Weiss, Sections 14.1 & 14.2
  Lindsey, Chapter 5, 233-246

November 20 & 22: **No Class, Thanksgiving break**

Tuesday, November 27: Regression, Correlation, & Intro to Multiple Regression

- Textbook:
  Gailmard, Sections 7.5 & 8.5
- Additional Resources:
  Weiss, Sections 14.2 & 15.1-15.2

Thursday, November 29: Multiple Regression & Regression Extensions

- Textbook:
  Gailmard, Section 2.3.7 & 7.7
- Additional Resources:
  Weiss, Sections 14.2 & 14.3

Tuesday, December 4: Causal Inference/Bayesian Statistics

- Textbook:
  Gailmard, Chapter 10/Section 9.4

Thursday, December 6: Final Exam Review

- Bring questions!

TBD: **FINAL EXAM**

Lab Sessions Calendar

August 22: Algebra Review, Sets, & Functions

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

August 29: Limits & Continuity

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

September 5: Differential Calculus I

- Kropko, Chapter 4
- Moore & Siegel, Chapter 5

September 12: Integral Calculus I

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

September 19: Multivariate Calculus

- Kropko, Chapters 5 & 7.2 & 7.4
- Moore & Siegel, Chapters 8, 15, 16

September 26: Finding Maxima and Minima

October 3 & 10: Linear Algebra

- Kropko Chapters 8 & 9
- Moore & Siegel, Chapter 12

October 17 & 24: STATA Tutorial

October 31: Linear Algebra Cont.

- Kropko, Chapter 10.1-10.3
- Moore & Siegel, Chapter 13

November 7: STATA Tutorial

November 14: Eigenvalues & Markov Chains

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

November 21: **Thanksgiving Break**

November 28: Markov Chains & Simulation based inference

December 5: Catch up & Review for Final