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## **POLI:5001:0001 Introductory Methodology**

Tues & Thurs 11:00am – 12:15pm

Wed 5:30–6:20pm

176 Schaeffer Hall

*Fall 2019*

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### **Course Information**

Instructor: Prof. Menninga

Office: 311 SH

Office Hours: Tues & Thur: 1:30-3:00 pm, or by appointment

Phone: (319) 335-3835

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Class Website: [icon.uiowa.edu](http://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, Byung-Deuk Woo, will run 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 available on-line through OpenStax for free.

- Illowsky & Dean. *Introductory Statistics*. OpenStax

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, Byung-Deuk, has office hours on Monday 12:30 - 5:30, Tuesday 2:30 - 3:30, Wednesday 12:30 - 2:30, Thursday: 2:30 - 3:30, 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 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: Thursday, October 17
- 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 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**

**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 the absence policies for their courses, which will vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, unavoidable circumstances, or University authorized activities (<https://clas.uiowa.edu/students/handbook/attendance-absences>). Students may use this absence form to communicate with instructors: <https://clas.uiowa.edu/sites/default/files/ABSENCE%20EXPLANATION%20FORM2019.pdf>.

**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>.

**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 a course 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 CLAS in 120 Schaeffer Hall. For more information, see <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. Visit <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 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 University's Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity ([diversity.uiowa.edu](https://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/>.

**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<sup>1</sup>

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

### Introduction to Statistics

Tuesday, August 27: Introduction

- Textbook:  
Gailmard, Chapter 1

Thursday, August 29: **No Class APSA**

Tuesday, September 3: Data & Descriptive Statistics

- Textbook:  
Gailmard, Chapter 2, pp. 12-38

### Probability

Thursday, September 5: Introduction to Probability

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

Tuesday, September 10: Bayes' Rule & Conditional Probability

- Textbook:  
Gailmard, Chapter 4, pp. 90-98
- Additional Resources:  
Kropko, Section 3.5 & 3.6  
Moore & Siegel, Chapter 9.2.3

Thursday, September 12: Probability & Categorical Data

- See ICON for:  
Lindsey, Chapter 1, pp. 19-33

### Distributions

Tuesday, September 17: Categorical Data (Cont.)

- Textbook:  
Gailmard, Chapter 4, pp. 98-106
- Additional Resources:  
Moore & Siegel, Chapter 10.1-10.5

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<sup>1</sup>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.

Thursday, September 19: Discrete Probability Distributions: Moments

- Textbook:
  - Gailmard, Chapter 4, pp. 106-114
  - Gailmard, Chapter 5, pp. 116-124
  - Gailmard, Chapter 5, pp. 124-132
- Additional Resources:
  - Moore & Siegel, Chapter 10.7

September 24, 26, & October 1: Continuous Probability Distributions

- Textbook:
  - Gailmard, Chapter 2, pp. 40-43
  - Gailmard, Chapter 4, pp. 98-114
  - Gailmard, Chapter 5, pp. 116-132 (again)
- Additional Resources:
  - Moore & Siegel, Chapter 11.1-11.2

October 3 & 8: Types of Distributions & Picking the Right One

- Textbook:
  - Gailmard, Chapters 3 & 6 pp. 137-166, 172-185
- Additional Resources:
  - Moore & Siegel, Chapters 10.6 & 11.3

Thursday, October 10: Models & Inference for Binary Response Variables

- Textbook:
  - Lindsey, Chapter 2, pp. 60-84
  - Gailmard, Chapter 6, pp. 142-151

Tuesday, October 15: Review Problems & Catch Up

- Bring questions!

Thursday, October 17: **Midterm Exam**

### **Sampling & Uncertainty**

Tuesday, October 22: Sampling (Validity, Reliability, I.I.D.)

- Textbook:
  - Gailmard, Sections 3.2, 7.1

Thursday, October 24: Point Estimation

- Textbook:
  - Gailmard, Sections 9.2, 7.1-7.3

Tuesday, October 29: Confidence Intervals

- Textbook:
  - Gailmard, Section 7.4, 7.6, 9.1

Thursday, October 31: Bootstrapping & Jackknifing

- See Readings on ICON

## **Hypothesis Testing & Inference**

Tuesday, November 5: Hypothesis Testing & Statistical Inference

- Textbook:  
Gailmard, Sections 8.1-8.3

Thursday, November 7: **No Class Peace Science**

Tuesday, November 12: Discussion of p-values & Alternatives to NHST

- See readings on ICON

Thursday, November 14: Analysis of Variance

- Textbook:  
Gailmard, Section 8.4.2

Tuesday, November 19:  $\chi^2$  & Measures of Association

- Textbook:  
Gailmard, Section 8.7.1

Thursday, November 21: Measures of Association (Cont.)

November 26 & 28: **No Class, Thanksgiving break**

## **Regression**

Tuesday, December 3: Measures of Association & Non-parametric Tests

- Textbook:  
Gailmard, Sections 8.7

Thursday, December 5: Bivariate Regression

- Textbook:  
Gailmard, Sections 2.3.5, 7.5, & 8.5

Tuesday, December 10: Multiple Regression & Regression Extensions

- Textbook:  
Gailmard, Section 2.3.6, 7.5.3

Thursday, December 12: Final Exam Review

- Bring questions!

TBD: **FINAL EXAM**

## Lab Sessions Calendar

August 28: **No Class APSA** 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 4: Limits & Continuity

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

September 11: Differential Calculus

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

September 18: Integral Calculus

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

September 25: Multivariate Calculus

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

October 2: Finding Maxima and Minima

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

October 9 & 16: Linear Algebra

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

October 23, 30, & November 6: STATA Tutorial

November 13: Linear Algebra (Cont.)

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

November 20: Eigenvalues & Markov Chains

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

November 27: **Thanksgiving Break**

December 4: Markov Chains & Simulation based inference

December 11: Catch up & Review for Final