

DEPARTMENT OF POLITICAL SCIENCE
UNIVERSITY OF TORONTO

POL 232H1: INTRODUCTION TO QUANTITATIVE REASONING II

(SECTION L0201)

WINTER 2018

COURSE OUTLINE

CLASS TIME: **THURSDAYS, 10AM–12 PM**
CLASS LOCATION: **SS 561 (SIDNEY SMITH HALL 561)**

INSTRUCTOR: Prof. Ludovic Rheault
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OFFICE HOURS: Tuesdays, 1–3 PM
OFFICE LOCATION: Sidney Smith 3005

TEACHING ASSISTANT: Eve Bourgeois
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Course Description

Data analysis has become an essential skill for the job market and graduate studies. Whether they choose to pursue a career in government, the private sector or non-governmental organizations, students will have to deal with empirical data on a regular basis. For instance, they may be asked to interpret statistics comparing economic outcomes across countries, measuring social mobility for various groups of population, or assessing the environmental impact of public policies.

To prepare them adequately for the modern work environment, this course provides students with an introduction to applied data analysis. We will cover not only the theory behind statistical methods, but also concrete applications. Students will be introduced to fundamental concepts in statistics. In particular, the course covers descriptive statistics, visualization techniques, measures of association between variables, regression analysis, and deals with the key concept of *statistical inference*. The course also includes practical training with the most widely used programming language for statistical computing: R. By the end of this course, students will be able to conduct basic statistical analysis independently.

Course Format

The pedagogical approach focuses on examples based on real-world political data, so that students can more easily relate the methods they learn to concrete applications. The course consists of lectures given in a computer lab on Thursdays, combined with tutorials directed by a teaching assistant (TA) every other week. The tutorials are taking place in the same classroom, before or after the lectures, with the class divided into two smaller groups. Tutorials provide students with opportunities to practice with the help of the teaching assistant.

Participation in class is invited, and students are encouraged to expand their learning experience through interactions with their classmates. In particular, students can work in teams to complete the exercises and term paper.

Contact Policy

Questions about the course material can be asked to the teaching assistant, who will hold office hours throughout the term in addition to tutorial sessions, or by visiting the professor during office hours. Emails should be restricted to administrative and formal questions, since they are sub-optimal for providing feedback and explanations about the concepts we study during the course.

Marking Scheme

Exercise #1	20%	Due: February 8, 2017.
Exercise #2	20%	Due: March 1, 2017.
Final Test	25%	March 22, 2017.
Term Paper	25%	Due: April 4, 2017.
Participation	10%	Throughout the semester.

Readings

REQUIRED

- **Alan Agresti and Barbara Finlay. 2009.**
Statistical Methods for the Social Sciences. 4th Ed. Prentice Hall.
 - Available at the UofT Bookstore. For those students with a tight budget, know that the textbook has been used in POL 232 in previous years, which means that there may be used copies in resale stores. Used copies may also be available online on websites such as amazon.com.
 - Abbreviated as **AF** below.
- **James E. Monogan III. 2015.**
Political Analysis Using R. Springer.
 - Available in electronic format for registered students via the UofT library, or at the Bookstore.
 - Abbreviated as **M** below.

OTHER USEFUL GENERAL REFERENCES

- David S. Moore, William I. Notz and Michael A. Fligner. 2013. *The Basic Practice of Statistics*. 6th Ed. W. H. Freeman and Company.
 - An exhaustive substitute to the main textbook **AF**. Students may opt for this one as long as they are willing to find the corresponding chapters to follow along.
- Phil H. Pollock III. 2014. *An R Companion to Political Analysis*. CQ Press.
 - Could be used as a substitute to **M**.
- Andy Field, Jeremy Miles and Zoé Field. 2012. *Discovering Statistics Using R*. Sage.
 - Another introductory book on R available at the Robarts library.

Software

For practical exercises, the course relies upon the [R language for statistical computing](#), one of the most popular choices for data analysis in both the academia and private organizations. In-class examples will be provided from [RStudio](#), a free graphical interface to use the R language. Both R

and RStudio (non-commercial) are free to use and students may choose to install them on their personal computers to practice exercises if they wish to.

The required software will be available on all stations in the SS 561 computer lab. For students who do not have access to a personal computer, know that R is available in most computer labs across the campus and in the Department of Political Science.

Teaching Assistant and Tutorial Groups

Eve Bourgeois, PhD student in the Department of Political science, is the teaching assistant for this course. She will be leading the tutorial sessions.

Tutorials take place immediately before (9AM-10AM) or after class (12PM-1PM), depending on the group students have chosen. Students will be able to register for either group on Blackboard at the beginning of the term. The tutorial room is also the computer lab SS 561.

Evaluations

Exercises

The exercises are problem sets in which students are asked to analyze political data using the methods learned during class. These problem sets can be done in teams of two students and are to be handed in at the due date.

Term Paper

The term paper is an original research report (2,000–2,500 words in length, or 7–8 pages) in which students are asked to put into practice at least some of the methods learned during the course. Students may use one of the datasets at their disposal or collect original data. Topics require approval from the TA. Collaborative work is welcome, and the term work can be done in teams of up to two students.

Late Penalty: The **late penalty** for the exercises and term paper is **2 percentage points per day**, including weekends.

Demands for appeal regarding a mark are to be justified in writing (250 words maximum) and submitted to the TA first. The policy of the Faculty of Arts and Science reads:

If a TA originally marked the work, the remarking request should go first to the TA and any appeal of that should go to the course instructor.

Such a request entails a remarking of the work. Hence, if a remarking is granted, the student must accept the resulting mark as the new mark, whether it goes up or down or remains the same. Continuing with the remark or the appeal means the student accepts this condition.

Participation

Developing skills with statistical analysis requires practice. Participation points are used to ensure that students are actually completing in-class exercises. The marks will be attributed proportionally to students' attendance and participation during tutorials. One out of 10 participation marks will be granted for filling out the course evaluation at the end of the term.

Final Test

The final test takes place at the end of the semester during regular class hours. This is a closed-book test. Relevant formulas and memory help will be made available to students.

Illness, Accommodations, Extensions

Requests for extensions or to retake a missed evaluation are only possible when a recognized form of documentation is provided. The Faculty of Arts and Science recognizes the following four (4) types of documentation:

- The [UofT Verification of Illness or Injury Form](#).
- The Student Health or Disability Related Certificate.
- The Letter of Accommodation from Accessibility Services.
- A letter from the College Registrar.

To ensure a fair treatment to all students, the instructor and TA are not authorized to provide extensions or special accommodations due to reasons not covered by the documentation above, for instance a busy schedule or extra-curricular activities.

If you face a serious problem of a personal or familial nature that affects your ability to fulfill your obligations, you may refer to your College Registrar for assistance. As indicated above, we accept recommendations coming from registrars.

Extensions on Exercises or Term Paper

If you can provide one of the forms of documentation mentioned in the section above and are requesting an extension on a written work, *please staple a visible copy of that documentation along with the work at the time of submission*. The TA will make the necessary adjustment based on the dates indicated on the documentation.

Missed Test

Students who do not write the final test should provide one of the forms of documentation indicated above, and inform the instructor as early as possible after the missed evaluation.

Missed Tutorial

Tutorial participation marks will allow for one absence during the term. Therefore, if you cannot attend one tutorial due to some obligation or the religious observance of a holiday, this will not affect your participation mark.

Petition Process

The ultimate deadline for the academic year is normally set to one week after the end of the April examination period. Requests regarding any missing term work beyond that date can only be done using a petition process, which is initiated through your College Registrar.

Turnitin.com Statement

Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site.

Academic Integrity Statement

Please read the following statement regarding academic integrity. For more information, consult the link provided below to consult UofT's Code of Behaviour.

Academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the U of T degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves.

Familiarize yourself with the University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>). [...]

Class Schedule: Summary of Readings, Tutorials and Due Dates

The following table summarizes the schedule for lectures and tutorials. Readings for each week are indicated using acronyms: **AF** refers to the main textbook (Agresti and Findlay 2009) and **M** refers to the R textbook (Monagan 2015). Numbers refer to chapters.

Date	Description	Readings	Tutorials	Due Dates
January 4	Course introduction and R Language	AF1 M1		
January 11	R Language & Univariate Statistics	AF2 M1-2	Tutorial 1	
January 18	Measures of Central Tendency	AF3 M4		
January 25	Distributions and Visualization	AF4 M3	Tutorial 2	
February 1	Statistical Inference	AF5 M5		
February 8	Measures of Association I	AF6-7 M5	Tutorial 3	Exercise #1 Due
February 15	Measures of Association II	AF8 M5		
February 22	[Reading Week–No Class]			
March 1	Linear Regression I	AF9 M6	Tutorial 4	Exercise #2 Due
March 8	Linear Regression II	AF10-11 M6		
March 15	Linear Regression III	AF12,14 M6	Tutorial 5	
March 22	Final Test			Final Test
March 29	Logistic Regression	AF15 M7.1	Tutorial 6	
April 4	[End of Term]			Term Paper Due

Note: Dates for each topic may be adjusted depending on the progress made during class and to maximize the pedagogical benefits to students.

Detailed Schedule

1. Introduction to Data Analysis and R

(January 4-11)

- **Required Readings:**

- AF1-2; M1-2.

- **Topics:**

1. Computers and the (big) data revolution.
2. Overview of fundamental concepts in data analysis.
3. Causality and inference.
4. Sources of data in political science.
5. Introduction to R: data types, input/output, arrays, functions, plots.

Tutorial 1: Introduction to R (January 11)

2. Measures of Central Tendency and Dispersion

(January 18-25)

- **Required Readings:**

- AF3-4; M4.

- **Topics:**

1. Variable types.
2. Measures of central tendency.
3. Measures of dispersion.

3. Distributions and Visualization Techniques

(January 25)

- **Required Readings:**

- AF4; M3.

- **Topics:**

1. Probability and distributions.
2. The normal distribution.
3. Sampling distribution and central limit theorem.
4. Graphs and visualization techniques in R.

Tutorial 2: Univariate Analysis and Visualization (January 25)

4. Statistical Inference

(February 1)

- **Required Readings:**
 - AF5; M5.
- **Topics:**
 1. Statistical inference.
 2. Confidence intervals.
 3. Significance tests.

5. Measures of Association I

(February 8)

- **Required Readings:**
 - AF6–7; M5.
- **Topics:**
 1. Measures of association for continuous variables.
 2. Comparing means.
 3. Comparing proportions.
 4. Significance testing: z-test and t-test.
 5. Correlation and covariance.
- **Exercise #1 Due on February 8.**

Tutorial 3: Measures of Association in R (February 8)

6. Measures of Association II

(February 15)

- **Required Readings:**
 - AF8; M5.
- **Topics:**
 1. Measures of association for discrete variables.
 2. Contingency tables.
 3. Chi-square test.

February 22: Reading Week—No Class

7. Linear Regression I (March 1)

- **Required Readings:**
 - AF9; M6.
- **Topics:**
 1. Linear regression framework.
 2. Ordinary least squares.
 3. Statistical inference in linear regression.
 4. Coefficient of determination.
- **Exercise #2 Due on March 1.**

Tutorial 4: Measures of Association and Linear Regression (March 1)

8. Linear Regression II (March 8)

- **Required Readings:**
 - AF10–11; M6.
- **Topics:**
 1. Linear regression: estimation, inference and interpretation.
 2. Multiple (multivariate) linear regression.
 3. Interaction terms.

9. Linear Regression III (March 15)

- **Required Readings:**
 - AF12,14; M6.
- **Topics:**
 1. Multiple linear regression (continued).
 2. Regression diagnostics.
 3. Violations of assumptions of linear regression.

Tutorial 5: Linear Regression II (March 15)

March 22: Final Test

(Location and Time: Same as regular class.)

10. Logistic Regression

(March 29)

- **Required Readings:**

- AF15; M7.1.

- **Topics:**

1. Logistic regression.
2. Maximum likelihood.
3. Overview of advanced topics in statistics.

Tutorial 6: Logistic Regression and Tips for Term Paper (March 29)

April 4: Term Paper Due