

**POLS6024 - 2017-2018**  
**Introduction to Quantitative Research Methods**

<b>Lecturer:</b>	James Cheshire & Stephen Jivraj
<b>Office Hours:</b>	JC: by appointment SJ: Thursdays 12:00-13:30.
<b>Teaching:</b>	20 hours of lectures, 10 hours of computer tutorials
<b>Credits:</b>	0.5 Module Units/ 4 US Credits/ 7.5 ECTS Credits
<b>Assessment:</b>	One 3,000 word essay (100%)
<b>Essay Deadline:</b>	Wednesday 25th April by 2pm
<b>Attendance:</b>	Attendance is compulsory at all lectures and seminars for which students are timetabled. Attendance will be monitored and no student will be entered for assessment unless they have attended and pursued the module to the satisfaction of the department.

**USEFUL LINKS**

**Lecture and Seminar Times:**

Online Timetable at [www.ucl.ac.uk/timetable](http://www.ucl.ac.uk/timetable)

**UG Student Intranet**

<https://www.ucl.ac.uk/political-science/intranet/ug>

**Extenuating Circumstances**

<http://www.ucl.ac.uk/spp/intranet/ug/assessment/extenuating-circumstances>

**Penalties for Late Submission and Overlength Essays**

<http://www.ucl.ac.uk/spp/intranet/ug/assessment/essays>

**Essay Submission Information**

<http://www.ucl.ac.uk/spp/intranet/ug/assessment/essays>

**Essay Writing, Plagiarism and TurnItIn**

<http://www.ucl.ac.uk/spp/intranet/ug/assessment/essays>

<http://www.ucl.ac.uk/current-students/guidelines/plagiarism>

<http://www.ucl.ac.uk/Library/CitationPlagiarism.doc>

## Content

This module introduces students to quantitative research methods in the social sciences by covering the basics of what is required for those considering a career involving data analytics. It assumes no knowledge of quantitative methods or statistical software. The module caters for students from diverse academic disciplines and adopts a practical hands-on approach to learning, with tutor supported computer tutorials. The module covers descriptive statistics, data visualisation, data access, probability, sampling, hypothesis testing, inferential statistics and ends with an introduction linear regression. Students will be introduced to the R statistical software and work with data used in current academic research.

By the end of the module, students will be able to:

- identify and understand levels of measurement
- examine and visualise data using descriptive statistics
- use basic commands in R
- understand probability and statistical inference
- conduct basic statistical tests
- run and interpret simple linear regression

## Lectures and tutorials

Each week there will be an introductory lecture followed by a computer tutorial. The lecture will last two hours and the tutorial will last one hour. The lectures will introduce students to many of the ideas and issues relating to the various topics. The computer tutorials will provide an opportunity to implement the techniques covered in the lectures. The first three tutorials provide an introduction to R.

Lectures: TBC

Computer tutorial: TBC

## Assessment

The module is assessed through the completion of one essay based on the secondary analysis of quantitative data. It accounts for 100% of the total marks on the module. The essay must be a **maximum of 3,000 words**. Please include the word count at the top of the essay and submit your essay using your candidate number as the filename. Please check the Department of Political Science essay submission checklist and penalties for late submission and exceeding word limits.

The deadlines for the essay is as follows:

**Wednesday 25<sup>th</sup> April 2018, 2pm**

You will find useful guidance for writing and presenting essays on the Department of Political Science student website. These guidelines are designed to help you, and you should read them carefully and do your best to follow them. Good essays give clear and focused answers to the question asked, they have clear structures, and they will be adequately and appropriately referenced. They do not provide a vague and unstructured discussion of the topic. Plagiarism is taken extremely seriously and can disqualify you from the module (for details of what constitutes plagiarism see <http://www.ucl.ac.uk/current-students/guidelines/plagiarism>). If you are in doubt about any of this, ask the tutor.

## Other non-assessed work

The computer tutorials will allow students to apply and test their knowledge of the material covered on the module and weekly exercises should be submitted for feedback from the module tutor. It is intended that students will complete weekly exercises outside of class.

## Reading list

In order to gain a sufficient understanding of the concepts and techniques taught on this module, students will need to do background reading. No one book covers all of the content on the module, and it is worth reading as widely as possible. Note also there are useful online resources, with some examples included below.

The core reading is covered by the following open-source e-books available:

Diez et al. 2013. *OpenIntro Statistics*, 2<sup>nd</sup> Edition. <http://www.openintro.org/stat/textbook.php>

Lane et al. Online Edition. *Introduction to Statistics*. [http://onlinestatbook.com/Online\\_Statistics\\_Education.pdf](http://onlinestatbook.com/Online_Statistics_Education.pdf)

Please note many of the following texts and web-resources go beyond the level required for the module:

- Levin, Jack, James Fox, and David Forde. 2009. *Elementary Statistics in Social Research*, 11<sup>th</sup> edition. (international ed) Pearson/Allyn and Bacon.
- Agresti, Alan, and Barbara Finlay. 2009. *Statistical Methods for the Social Sciences*. New Jersey: Pearson Education. International edition, 4<sup>th</sup> (or 3<sup>rd</sup>) ed.
- Kellstedt, Paul M., and Guy D. Whitten. 2013. *The Fundamentals of Political Science Research*. Cambridge: Cambridge University Press.
- Elliott, J. and Marsh C. (2008) *Exploring Data* (2<sup>nd</sup> Edition) Polity Press
- Garner, Roberta. 2010. *The Joy of Stats: A Short Guide to Introductory Statistics in the Social Sciences*. Ontario: University of Toronto Press. (especially the “Math Refresher” section)
- Salkind, Neil J. 2004. *Statistics for People Who Think They Hate Statistics*. London: Sage.
- Dalgard, Peter. 2008. *Introductory Statistics with R* (2<sup>nd</sup> edition).
- Field, A., Miles, J. and Field, Z. (2012) *Discovering Statistics Using R*. London: Sage.

Most of the reading is available in UCL library, although there are generally limited copies. Many items are also held in Senate House library.

## Online resources

There are many web-based resources for the study of quantitative methods and the R statistical software. Students may find useful those listed below.

Online interactive e-books covering statistical principles in the first half of the module

<http://onlinestatbook.com/2/index.html>

<http://www.openintro.org/stat/>

Statistical glossary - includes some good simple explanations of basic concepts used in module

<http://www.stats.gla.ac.uk/steps/glossary/index.html>

Statsoft electronic statistics textbook covering many of the techniques covered in the module

<http://www.statsoft.com/textbook/stathome.html>

## R resources

UCLA Statistical Consulting Group introduction to R

<http://www.ats.ucla.edu/stat/r/seminars/intro.htm>

Neat websites with basic data analysis commands described

<http://www.statmethods.net/index.html>

<http://www.cookbook-r.com>

The R Guide to UK Data Service key UK Surveys

<http://ukdataservice.ac.uk/media/398726/usingr.pdf>

Producing simple graphics with R

<http://www.harding.edu/fmccown/r/>

## Week 1 (JC)

### Lecture: Understanding data

After providing an overview of the aims, learning objectives and practical arrangements for the module, the lecture moves on to take a brief look at the notion of variables and how they are measured, frequency distributions and ways of describing the central tendency and the dispersion of a variable.

### Tutorial: Introduction to R

The first week provides an introduction to the statistical software R, which will be used in all subsequent tutorials. Students will learn how to download and install R, enter simple data into R, how to load data sets from other statistical packages into R and how to use the R environment for simple calculations.

### Core reading

Lane et al. Chapter 1 and Chapter 3

### Supplementary reading

Diez et al. Sections 1.1-1.2

## Week 2 (JC)

### Lecture: Examining data 1

This session explores a survey dataset to identify and describe different types of variables using R. Various techniques for looking at variable distributions, including table and basic univariate graphs

### Tutorial: Describing data I

The practical provides an introduction to univariate (one variable) descriptive statistics and graphs in R, including frequency tables, histograms and boxplots.

### Core reading

Lane et al. Chapter 2

### Supplementary reading

Diez et al. Sections 1.6-1.7

## Week 3 (JC)

### Lecture: Examining data 2

This session explores a survey dataset to identify and describe different types of variables using R. Various techniques for looking at variable distributions, including tables, graphs and summary statistics are considered. We also address access to data and data management such as how to recode a variable.

### Tutorial: Describing data II

This practical explores descriptive bivariate statistics and graphs using R, including two-way tables, bar charts, line graphs and scatterplots.

### Core reading

Diez et al. Sections 1.6-1.7

### Supplementary reading

Lane et al. Chapter 4 (up to pp. 170)

## Week 4 (JC)

### Lecture: Introducing Geographic Data

This session will be an opportunity to recap some of the core principles introduced in the previous 3 weeks before introducing geographic data. We will discuss why geographic data are different and explore how mapping and spatial analysis are useful tools for quantitative analysis.

### Tutorial: Mapping

This practical will teach you how to map data using R as well as perform basic analysis with spatial datasets.

## Week 5 (SJ)

### Lecture: Probability and the normal distribution

The basics of probability theory are introduced as well as concepts of probability distributions, the normal curve, and sampling distributions of means.

**Tutorial: Sampling distribution of the mean**

This session introduces sampling distributions using a simple simulated data set in R.

**Core reading**

Lane et al. Chapters 7 & 9

**Supplementary reading**

Diez et al. Chapter 3 (up to pp. 128) & Chapter 4 (up to pp. 164)

**Week 6 (SJ)**

**Lecture: Confidence intervals and significance**

The session explores the ability to generalise the findings from analysis of sample data to the wider population (inference). The theory of hypothesis testing, confidence intervals and statistical significance are introduced.

**Tutorial: Testing for sampling error**

This practical follows on from the previous week using the simulated data to derive confidence intervals.

**Core reading**

Lane et al. Chapters 10 & 11

**Supplementary reading**

Diez et al. Sections 4.2-4.3.

**Week 7 (SJ)**

**Lecture: Measures of difference (SJ)**

This lecture considers statistical hypothesis tests for the difference in two means from paired and independent samples and the difference in two categorical variables.

**Tutorial: Tests of significance**

The session explores the use of appropriate use of test of significance for a mean.

**Core reading**

Lane et al. Chapters 12 & 17

**Supplementary reading**

Diez et al. Chapter 5 & Chapter 6.3 & 6.4

**Week 8 (SJ)**

**Lecture: Exploring relationships between interval variables**

This lecture starts with a look at graphical approaches of exploring the relationship between interval variables using scatterplots introduced in lecture 2 before moving on to look at measures of correlation and associated statistical tests and how to interpret them.

**Practical: Exploring relationship between categorical variables**

We cover how to test the statistical significance of two-way samples using a simple Chi Square test (use of the Cramers V test is also included as a measure of the strength of association between two variables).

**Core reading**

Lane et al. Chapter 4

**Supplementary reading**

Diez et al. Section 7.1

Field et al. Chapter 6.

**Week 9 (SJ)**

**Lecture: The simple linear regression model**

This lecture introduces the theory and practice of simple linear regression and how to interpret the output. The components of a simple linear regression model are described and explained before looking at how to interpret the output and checking the assumptions of the method are met.

**Practical: Correlation and linear regression**

The session first covers how to run and interpret of two statistical tests of correlation (Pearson's  $r$  and Spearman's  $\rho$ ) and then how to design, run, and interpretation of a simple linear model.

**Core reading**

Diez et al. Sections 7.2-7.4

**Supplementary reading**

Lane et al. Chapter 14 (up to pp. 483).

Field et al. Chapter 7 (up to pp. 260).

**Week 10 (SJ)****Lecture: Assumptions of linear regression (SJ)**

The purpose of this lecture is to explore the basic assumptions underlying the multiple linear regression model such as collinearity, outliers/leverage and correlated residuals.

**Tutorial: Testing the assumptions of multiple linear regression (SJ)**

This tutorial enables students to assess their linear regression models by testing for the basic assumptions underlying this statistical method.

**Core reading**

Field et al. Section 7.7 & 7.9.

**Supplementary reading**

Lane et al. Chapter 7 (pp. 478 to up to pp. 487).

Diez et al. Section 8.3