

## Contact Information

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## Description

This is the first semester PhD course in quantitative methods for political science students from Trinity College Dublin (TCD) and University College Dublin (UCD). This course is cross-listed at UCD as POL50070 “Introduction to Statistics”.

This module covers the basics of statistical analysis. We go step by step from describing simple and more complex data, to issues of random samples, to the types and requirements of statistical inference, and finally to linear statistical models. As such, the course forms a good foundation for further training in statistical modelling, in particular “Quantitative Methods II”.

You will learn how to use the free, multi-platform statistical software package R, a powerful tool that will serve you well for quantitative analysis and graphical presentation of data at *any* level.

The focus is on practice. This is reflected in the choice of texts and in the emphasis on applied coursework. Consequently the learning method combines lectures and reading with hands-on statistical programming exercises using real datasets.

## Prerequisites

Basic knowledge of mathematics, esp. algebra. The statistical software **R** will be used for examples and, although we will start from its basics, the students are strongly advised to work with it as much as possible outside of the classroom.

## Meetings

The course lasts 12 weeks (incl. reading week). It will consist mostly of lectures and presentations, with some practical data analysis relating to weekly problem sets. If possible, bring your (charged) laptop computers. *Install (and familiarise yourself with) R if you have not already done so.*

## Computer software

We will use R, a free but very powerful software. It can be downloaded from <http://www.r-project.org> (see also Verzani, 2005, Appendix A). You should download and install this right away, so that you can get as much hands-on practice as possible. A nice resource for learning R is at <http://tryr.codeschool.com/>

## Grading

- Problem sets: 50%. There will be five problem sets, handed out in class or by email. They must be returned on Turnitin BEFORE the beginning of the following class. Scanned versions of your (neatly written) answers are fine. Group work is fine, but the answers and especially the write-up should be your own. Answers should always be explained. Assignments will be distributed and due as specified in table 1.

| Assignment # | Week Distributed | Week Due | Main Topics                                   |
|--------------|------------------|----------|---|
| 1            | 2                | 3        | Data manipulation & description               |
| 2            | 4                | 5        | Multivariate data & probability distributions |
| 3            | 6                | 8        | Inference and Hypothesis testing              |
| 4            | 9                | 10       | Comparing two populations; regression         |
| 5            | 11               | 12       | Multiple regression & hypothesis testing      |

Table 1: Assignment schedule

Late papers will be downgraded according to the standard school policy. Exemptions will be granted only on the basis of illness or bereavement, documented in all cases.

- Course paper: 50%. A course paper will be due on Dec. 20. For this paper you will be required to produce your own regression analysis, in a subject of your choice, and present the results and interpretation. Before the 5th class, you will have to submit a short (maximum one page) description of a plan for a paper, describing the key research question and where or how you think you will find the necessary data. This will allow me to give feedback before you dive into the details of your paper. The course paper should be also submitted to <http://turnitin.com>.

Please submit *all your written work* through Turnitin ([turnitin.com](http://turnitin.com)):

- Class ID: 13667251
- Password: quantastic

Please also follow the standard of academic honesty set forth in the College Calendar (see H18 paragraphs 76-79).<sup>1</sup>

<sup>1</sup>For more information on Turnitin and academic integrity, please visit: <http://tcd-ie.libguides.com/plagiarism>, <http://www.tcd.ie/CAPSL/readysteadywrite/>, and <https://www.tcd.ie/Science/current/PDF/plagiarism/Plagiarism.pdf>

## Readings

There are two textbooks for this class:

- Verzani, John. 2005. *Using R for introductory statistics*. Boca Raton, FL: Chapman & Hall/CRC.
- Moore, David S., George P. McCabe and Bruce A. Craig. 2012. *Introduction to the practice of statistics*. 7th international edition ed. New York: W.H. Freeman.

Older versions of either textbook are fine, though the section and chapter numbers may differ.

## Schedule Overview (susceptible to change)

| Week | Main Topic   |
|------|--|
| 1    | Introduction   |
| 2    | Univariate data  |
| 3    | Bivariate and Multivariate Data  |
| 4    | Sampling and Probability Distributions   |
| 5    | Estimation and statistical inference   |
| 6    | Hypothesis testing   |
| 7    | <i>Reading Week: no class</i>  |
| 8    | Comparing two groups, measures of association, and goodness of fit (Chi-Squared) |
| 9    | The linear regression model  |
| 10   | Multiple regression  |
| 11   | Regression: inference and hypothesis testing                                     |
| 12   | Categorical independent variables & interactions                                 |

## Schedule Details

### Week 1. Introduction

Required Readings:

Verzani, ch. 1

### Week 2. Univariate Data

Required Readings:

Verzani, ch. 2

Moore, McCabe and Craig, 1.1–1.2

### Week 3. Bivariate and Multivariate Data

Required Readings:

Verzani, Chs 3–4

Moore, McCabe and Craig (2.1-2.2, 2.5-2.6)

**Week 4. Sampling and Probability Distributions**

Required Readings:

Moore, McCabe and Craig (1.3, 3.2–3.3, Ch. 5)

Verzani, Ch. 5

**Week 5. Estimation and statistical inference**

Required Readings:

Verzani, ch. 6–7

Moore, McCabe and Craig (Chs. 6–8)

**Week 6. Hypothesis testing**

Required Readings:

Verzani, chs. 8

Moore, McCabe and Craig (Chs. 6–8)

**Week 7. Reading Week****Week 8. Comparing two groups, measures of association, and goodness of fit (Chi-Squared)**

Required Readings:

Verzani, ch. 9

Moore, McCabe and Craig (Ch. 9, sections 15.1–15.2)

**Week 9. The Linear Regression Model**

Required Readings:

Verzani, ch. 10

Moore, McCabe and Craig (section 2.3, ch. 10)

**Week 10. Multiple regression**

Required Readings:

Verzani, ch. 10

Moore, McCabe and Craig (sec. 2.4, ch. 11)

**Week 11. Regression: Inference and Hypothesis Testing**

Required Readings:

Verzani, Ch. 10

Moore, McCabe and Craig (chs. 10–11)

**Week 12. Categorical Independent Variables & Interactions**

Required Readings:

Verzani, ch. 10

Moore, McCabe and Craig (ch. 14)