

## **Introduction to Data Analysis 2013-2014**

**Instructor:** Dr Dimitra Politi

**Address:** 31 Buccleuch Place, office 3.13

**Email:** [Dimitra.Politi@ed.ac.uk](mailto:Dimitra.Politi@ed.ac.uk)

**Phone:** (0131 6)50 4060

**Office hours:** Tuesdays 3-4pm

**Web:** <http://homepages.econ.ed.ac.uk/~dpoliti/>

**Lecture times:** Semester 1, weeks 1-4: Fridays, 10:00-10:50am

Rest of year: Wednesdays, 10:00-10:50am

**Lecture locations:** Semester 1: Appleton Tower, Lecture Theatre 4.

Semester 2: David Hume Tower, Lecture Theatre A.

**Course description:** This course, which spans two semesters, is a short introduction to Probability Theory and Statistics. Starting from the definitions of probability and random variable, students will be introduced to the concept of probability distributions and random sampling. Special emphasis will be placed on the distribution of the sample average. Students will also explore the Central Limit Theorem and its consequences for large sample approximations. In semester 2, students will be introduced to the concepts of statistical inference, estimation and hypothesis testing. Theory will always be illustrated with examples, and emphasis will be placed on the connection between the theory and actual data processing. Substantial class time will be spent on short in-class exercises, in order to ascertain that students have understood the concepts discussed in the lecture. This practice will be reinforced by weekly online multiple choice quizzes, as well as exercises solved in small student groups during weekly tutorials.

**Aims and objectives:** Intelligent data processing is a skill that is becoming increasingly important in today's world. The abundance of information available makes it essential that students develop the tools to both extract knowledge and understand the limitations of data presented to them both in and outside of the workplace.

This class will review probability theory and introductory statistics in order to equip students with basic tools which are necessary for the analysis of "raw" information. It will prepare students for honours courses in Econometrics, but the materials studied will be useful for other economics courses and for life in general.

After attending these lectures, students should be familiar with basic concepts in probability and statistics, and be ready to take introductory courses in Econometrics. They should also be able to solve simple problems involving probability distributions as well as perform hypothesis testing and interval estimation in small and large random samples.

**Assessment:** please consult Econ 2 Outline/Handbook. Each assessment in Econ 2 will include a component of data analysis, with the exception of the essay and economics tutorial group assignments. **In order to progress to Economics Honours, students will need to achieve a mark of at least 40% in the Statistics part of the degree exam.**

**Tutorials:** Weekly tutorials, starting on week 2, complement the lectures and provide extra practice with the concepts discussed by the instructor. Students are strongly advised to use tutorials and the time spent with their tutor wisely, by trying to answer the questions before they attend each session.

**Online tests:** Weekly online multiple-choice questionnaires, which are accessible via Learn, are compulsory for students to complete. These tests further assist students to understand the material covered in lectures, and they also provide them with an opportunity to improve their test-taking ability.

**Class exams:** There will be a mid-semester class exam on Friday of week 5, and another one during the December exam diet. The degree exam will be in April/May 2014 exam diet. For details please consult the Econ 2 outline/Handbook.

**Readings and learning resources:**

- ❖ Lecture slides will be provided on Learn both in PowerPoint and PDF formats.
- ❖ Students are advised to consult introductory statistics and econometrics textbooks, for example:
  - [LM] Mathematical Statistics and its Applications, by Richard J. Larsen and Morris L. Marx (5<sup>th</sup> edition) (Pearson)
  - [RLT] Using Statistics in Economics, by R.L. Thomas (McGraw-Hill)
  - [SW] Introduction to Econometrics, by James M. Stock and Mark W. Watson, only chapters 1-3 (2nd edition) (Pearson)
  - [JW] Introductory Econometrics, A modern approach, by Jeffrey Wooldridge, Appendix chapters (4th edition) (South-Western Cengage Learning)
- ❖ Students looking for extra materials might also want to look at MIT's OpenCourseWare, in particular at course 14.30 (Introduction to Statistical Methods in Economics). See link: <http://ocw.mit.edu/courses/economics/14-30-introduction-to-statistical-methods-in-economics-spring-2009/>
- ❖ For those seeking extra materials and questions related to the material taught in this course, the University Library has a number of online resources, which go over the material covered in the lectures (and much more) and provide extra practice questions. To name a few:
  - Géza Schay: "Introduction to probability with Statistical Applications"
  - Ronald Meester: "A natural Introduction to Probability Theory"
  - Wolfgang Schwarz: "40 Puzzles and Problems in Probability and Mathematical Statistics" [for the more adventurous!]To have access to these resources, use the Library's search engine, which you can find using this link: <http://www.ed.ac.uk/schools-departments/information-services/library-museum-gallery>.
- ❖ The University of Edinburgh has bought licenses for an online statistics tutorial, called "**Statistics for the Terrified**", which you can use on campus and also download to use at home (for PC only). You can get information on the software using this link: <http://www.ed.ac.uk/schools-departments/information-services/services/learning-technology/s4t>

**Tentative Schedule (subject to change)**

**Semester 1: Probability Theory and Probability Distributions**

<b>Lecture 1, 20-09-2013</b>	<b>Introduction to Data Analysis in Economics (SW ch. 1)</b>
<b>Lecture 2, 27-09-2013</b>	<b>A primer on probability theory (LM ch. 2.1, 2.2, 2.3, 2.6)</b>
<b>Lecture 3, 04-10-2013</b>	<b>Conditional probability, independence, and Bayes' Theorem</b>
<b>Lecture 4, 11-10-2013</b>	<b>Random variables, Probability Distributions, and Statistical Independence</b>
<b>Lecture 5, 16-10-2013</b>	<b>Statistical Independence (continued)</b>
<b>Lecture 6, 23-10-2013</b>	<b>Characteristics of Probability Distributions and some examples</b>
<b>Lecture 7, 30-10-2013</b>	<b>The Normal, Chi-Squared, Student t and F distributions</b>
<b>Lecture 8, 06-11-2013</b>	<b>Random sampling and some sample statistics</b>
<b>Lecture 9, 13-11-2013</b>	<b>Large sample approximations, The Law of Large Numbers and Central Limit Theorem</b>
<b>Lecture 10, 20-11-2013</b>	<b>The Central Limit Theorem in action, and Semester I revision</b>

**Semester 2: Introduction to Statistics**

<b>Lecture 1, 15-01-2014</b>	<b>December exam discussion &amp; feedback, introduction to statistical inference, estimation, and hypothesis testing</b>
<b>Lecture 2, 22-01-2014</b>	<b>Estimators and their properties in small and large samples; the case of the population mean</b>
<b>Lecture 3, 29-01-2014</b>	<b>Hypothesis testing I: introduction and testing hypotheses about the population mean</b>
<b>Lecture 4, 05-02-2014</b>	<b>Hypothesis testing I: p-values</b>
<b>Lecture 5, 13-02-2013</b>	<b>Significance levels, Estimating the population variance</b>
<b>Lecture 6, 26-02-2014</b>	<b>The t-statistic</b>
<b>Lecture 7, 05-03-2014</b>	<b>Two-tailed and one-tailed tests, confidence intervals</b>
<b>Lecture 8, 12-03-2014</b>	<b>Comparing means from different populations, the t-statistic in small samples</b>
<b>Lecture 9, 19-03-2014</b>	<b>Relationships between two variables, approaches to estimation: Least Squares</b>
<b>Lecture 10, 26-03-2014</b>	<b>Approaches to estimation: Least Squares, Method of Moments, Maximum Likelihood, Semester II revision</b>