

# Probability and Statistics

Lecturer: Isabella Gollini

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This module is taught in the autumn and spring terms with eight lectures on Wednesday evenings in each term. In addition there are two separate workstation sessions on Wednesday evenings early in the autumn term, so that the module will be taught over 10 weeks in the autumn term, including the reading week and the final week of term. There will also be workstation sessions in the second half of the evening in four of the lecture sessions in the spring term, so that the module will be taught over 8 weeks in the spring term.

There will be two revision sessions in the summer term.

## Autumn term

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12th October	lecture (MAL 417)
19th October	workstation session (UCL Foster Court B29)
26th October	lecture (MAL 417)
2nd November	workstation session (UCL Foster Court B29)
9th November	lecture (MAL 417)
16th November	lecture (MAL 417)
23th November	lecture (MAL 417)
30th November	lecture (MAL 417)
7th December	lecture (MAL 417)
14th December	lecture (MAL 417)

## Spring term

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18th January	lecture (MAL 417)
25th January	lecture (MAL 417)
1st February	lecture (MAL 417)
8th February	lecture (MAL 417)
	reading week
22nd February	lecture (MAL 417) with workstation session (UCL Christopher Ingold G20)
1st March	lecture (MAL 417) with workstation session (UCL Christopher Ingold G20)
8th March	lecture (MAL 417) with workstation session (UCL Christopher Ingold G20)
15th March	lecture (MAL 417) with workstation session (UCL Christopher Ingold G20)

## About the course

The course provides an introduction to the analysis of statistical data and to probability theory. The statistical software **R** is introduced and used especially for the parts of the course that deal with the statistical analysis of data.

## Examination

The course will be examined by a three hour written examination in the summer term and by two pieces of assessed coursework, one in the autumn term and one in the spring term. The coursework will carry 20% of the total mark.

## Contact details

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## Lecture notes, exercises and assignments

Lecture notes will be handed out on a weekly basis. Exercise sheets will be handed out, both for the more mathematical and theoretical parts of the course and for practical work involving the statistical analysis of data, followed after an interval of time by solutions' sheets. These exercises will not form part of the course assessment but it is important for your understanding of the course that you work through them. In addition, there will be two pieces of assessed coursework.

## Outline syllabus

- An introduction to the statistical software R.
- Descriptive statistics and graphical methods.
- The elements of mathematical probability theory.
- Bayes' Theorem and its applications.
- Discrete random variables and probability distributions, including the binomial and Poisson distributions.
- Mean and variance of probability distributions.
- Continuous random variables and probability distributions, including the normal distributions.
- Populations, random samples and sampling distributions, including the t and chi-square distributions.
- Estimation, confidence intervals and hypothesis testing with special reference to samples from normal distributions and estimates of proportions.
- Chi-square tests of goodness of fit.
- Two-way contingency tables.
- An introduction to non-parametric methods.

## Recommended textbooks

1. Geoffrey Clarke & Dennis Cooke, *A Basic Course in Statistics* (5th edition) Hodder Arnold, 2004.
2. William Mendenhall, Robert J. Beaver & Barbara M. Beaver, *Introduction to Probability and Statistics* (13th edition) Brooks Cole, 2009.
3. Sheldon M. Ross, *Introductory Statistics* (3rd edition) Academic Press, 2010.
4. (A more advanced treatment) Robert V. Hogg and Elliot Tanis, *Probability and Statistical Inference* (8th edition) Pearson, 2009.

## Statistical tables

The following tables are recommended and will be provided in the examination: *New Cambridge Statistical Tables* (Second Edition), D. V. Lindley and W. F. Scott, Cambridge University Press, 1995. You may find it helpful to buy a copy.

## Downloading of course materials

Lecture notes and other course materials, including listings of data sets used in this module, may be downloaded from Moodle.