

# MACQUARIE UNIVERSITY

## STAT171 - Statistical Data Analysis

### Unit Information : 2004

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#### Introduction

This unit is intended for students with a high level of proficiency in mathematics. The unit provides an introduction to modern statistical principles and practice with special emphasis on data analytical techniques.

The aim of the unit is to promote an understanding of the principles involved in statistical analysis and to be able to analyse simple data sets using elementary techniques. You will also be required to analyse data using the statistical package Minitab.

#### Content

1. Data summarisation and display
2. Basic probability, Conditional Probability, Bayes
3. Random variables and probability distributions  
Specific probability distributions including the Binomial, Poisson, Normal
4. Sampling distributions and their properties
5. Estimates and their accuracy: Confidence Intervals
6. Hypothesis testing: two & one tailed tests  
Type I and Type II errors  
One sample tests of means and proportions (using continuity correction)
7. Two sample tests of means and proportions
8. Introduction to Experimental Principles and Design
9. Simple Linear Regression: calculation and hypothesis testing  
confidence intervals vs prediction intervals  
residual diagnostics (including normality plots)
10. Correlation
11. Analysis of categorical data  
goodness of fit tests  
independence tests  
Odds ratios
12. Power of a test and sample size
13. Non-parametric statistics  
nonparametric vs parametric tests  
Sign test  
Wilcoxon Two sample rank sum test

#### Textbook

Mendenhall, William, Beaver, Robert L. and Beaver, Barbara M. (2003)  
'Introduction to Probability and Statistics' Eleventh edition (Duxbury Press)

Student Resource Centre  
Division of Economic & Financial Studies  
MACQUARIE UNIVERSITY

## Other References

Ryan, B.F. & Joiner, B.L., (1994) 'The MINITAB Student Handbook', (3rd ed)	QA276.4.R88/1994
Devore, Jay L. (1995). Probability and Statistics for Engineering and the Sciences (4 <sup>th</sup> ed)	QA273.D46/1995
Moore D.S. & McCabe G.P., (1993) 'Introduction to the Practice of Statistics'	QA276.12.M65/1993
Griffiths D. et al, (1998) 'Understanding Data - Principles and Practice of Statistics'	QA276.G75
Hamilton, Lawrence C. (1990) 'Modern Data Analysis A First Course in Applied Stats'	QA276.12.H355/1990
Clarke, G.M. & Cooke D. (1998) 'A Basic Course in Statistics'	
Koopmans L.H., (1987) 'Introduction to Contemporary Statistical Methods', (2nd ed)	QA276.K65/1987
Chatfield, C., (1983) 'Statistics for technology'	TA340.C45/1983
Ehrenberg, A. S. C., 'A Primer in Data Reduction'	QA276.12E37
Mendenhall, W. & Ott, L., (1976) 'Understanding Statistics'	HA29.M5332/1976
Mosteller, F., (1983) 'Beginning Statistics with Data Analysis'	QA276.12.M67/1983
Rees, D.G., 'Essential Statistics'	QA276.12.R44
D.V. Huntsberger & Billingsley, P., (1987) 'Elements of Statistical Inference', (6th ed)	QA276.12.H86/1987

## Lectures

You are required to attend three lectures per week, held at the following times :

Tuesday 1 - 2 (X5B T1)                      Wednesday 1 - 2 (W5A Price)                      Thursday 1 - 2 (X5B T1)

A copy of the lecture notes will be made available each week in the lecture. Copies will also be available in ERIC (the Economics Resources and Information Centre – C5C244), and on the STAT171 website: <http://www.stat.mq.edu.au/units/stat171>

Lectures for week 1-9 will be taken by Ms. Suzanne Curtis.

Lectures for week 10-13 will be taken by Assoc. Prof. Gillian Heller.

## Workload

It is expected that a typical student will need to spend a total of 12 hours per week working on the material in STAT171. This time includes attendance at all classes, reviewing notes etc as well as preparation of work for submission. Some students may be able to spend less time than that recommended, whilst others will need to spend substantially more time.

## Tutorials

You are required to attend one tutorial per week. They will begin in the **second** week of classes. Tutorials in week 2 will be held in the C5C computer laboratories.

Tutorials in weeks 3 - 13 will be held in the tutorial rooms.

Lists showing the allocation of students to their tutorial class will be posted on the C5C courtyard noticeboards by the beginning of Week 2.

The tutorial exercises will be given out during lectures in the preceding week and will consist of two parts:

- (i) Questions for review and discussion during the tutorial - no solution will be made available for these exercises, and
- (ii) Selected text book questions which will **not** be discussed during the tutorial, but a solution will be made available on the STAT171 website at the end of each week.

It is expected that **all** the questions will be attempted by the students prior to their tutorial. The work **may** be collected during the tutorial for marking.

## Assignments

You will be required to submit three assignments during the semester, which will count a total of 10% towards your final assessment as detailed below.

The assignments will be due **by 10 am** on the due date and must be submitted via the STAT171 Assignment Box in ERIC (C5C244). Marks will be deducted for work submitted late.

The assignment will not be marked unless it is accompanied by an assignment cover sheet which clearly shows your name, your tutor's name and your tutorial time and makes a declaration that the work is your own work.

<u>Assignment</u>	<u>% of assessment</u>	<u>Due Date (week of teaching)</u>
Assignment 1	2 %	Tuesday 9 <sup>th</sup> March (week 2)
Assignment 2	4 %	Tuesday 6 <sup>th</sup> April (week 6)
Assignment 3	4 %	Tuesday 25 <sup>th</sup> May (week 11)

For all tutorials and assignments:

Whilst you are encouraged to discuss the work extensively with your peers, it will be expected that the final work handed in will be your **own** work. Any work that is copied from another student may result in disciplinary action for **all** students involved. You should read the section headed "The Dangers of Plagiarism and How to Avoid It".

## Computing

Much use will be made of the computers located in the student laboratories in C5C. In Week 2, instruction will be provided on the use of the statistical package Minitab, as well as the Windows operating environment. After that, you will be expected to use the computers regularly without supervision. If in difficulty, you should see your tutor or a Statistics staff member during their office hours.

The Minitab home page is <http://www.minitab.com>. Various download options are detailed here for home use.

## Calculators

You will need to equip yourself with a small calculator, preferably one that does simple statistical calculations (it should have  $\bar{x}$  and  $\sigma$  on it). **You should bring it to all tutorials.** You will also need your calculator for the mid-semester test and the final examination. You will **not** be permitted to use a calculator with an alpha character set in any examination.

## Assessment

This unit will be assessed as follows :

Assignments (as above)	10 %
Mid-semester test	10 %
Final examination	80 %

A satisfactory performance is required in all aspects of the unit. **To pass the unit you must pass the final examination.**

## Mid-semester tests and Final Examination

One compulsory mid-semester test (of 45 minutes duration) will be held during lectures. The test will take place during Week 8 of teaching (Mon 3<sup>rd</sup> – Fri 7<sup>th</sup> May).

If you are unable to attend the test, you must notify either Suzanne Curtis or Gillian Heller as soon as possible after the event, providing suitable documentation.

The Final Examination will be of 3 hours duration with 10 minutes reading time. All material covered in the unit is examinable.

For both the Mid-semester test and the Final examination you will be permitted to take into the exam room one A4 page of formulae or notes, written on one or both sides of the page in your own handwriting. No formulae will be provided, however all necessary statistical tables will be provided.

Gillian Heller  
Lecturer in Charge

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Suzanne Curtis  
Administration matters

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## THE DANGERS OF PLAGIARISM AND HOW TO AVOID IT

The integrity of learning and scholarship depends on a code of conduct governing good practice and acceptable academic behaviour. One of the most important elements of good practice involves acknowledging carefully the people whose ideas we have used, borrowed, or developed. All students and scholars are bound by these rules because all scholarly work depends in one way or another on the work of others.

Therefore, there is nothing wrong in using the work of others as a basis for your own work, nor is it evidence of inadequacy on your part, *provided you do not attempt to pass off someone else's work as your own.*

To maintain good academic practice, so that you may be given credit for your own efforts, and so that your own contribution can be properly appreciated and evaluated, you should acknowledge your sources and you should *ALWAYS*:

- (i) State clearly in the appropriate form where you found the material on which you have based your work, using the system of reference specified by the School in which your assignment was set;
- (ii) Acknowledge the people whose concepts, experiments, or results you have extracted, developed, or summarised, even if you put these ideas into your own words;
- (iii) Avoid excessive copying of passages by another author, even where the source is acknowledged. Find another form of words to show that you have thought about the material and understood it, but remember to state clearly where you found the ideas.

If you take and use the work of another person without clearly stating or acknowledging your source, you are falsely claiming that material as your own work and committing an act of *PLAGIARISM*. This is a very serious violation of good practice and an offence for which you will be penalised.

*YOU WILL BE GUILTY OF PLAGIARISM* if you do any of the following in an assignment, or in any piece of work which is to be assessed, *without clearly acknowledging your source(s) for each quotation or piece of borrowed material*:

- (a) Copy out part(s) of any document or audio-visual material, including computer-based material;
- (b) Use or extract someone else's concepts or experimental results or conclusions, even if you put them in your own words;
- (c) Copy out or take ideas from the work of another student, even if you put the borrowed material in your own words;
- (d) Submit substantially the same final version of any material as a fellow student. On occasions, you may be encouraged to prepare your work with someone else, but the final form of the assignment you hand in must be your own independent endeavour.