



**Macquarie University**

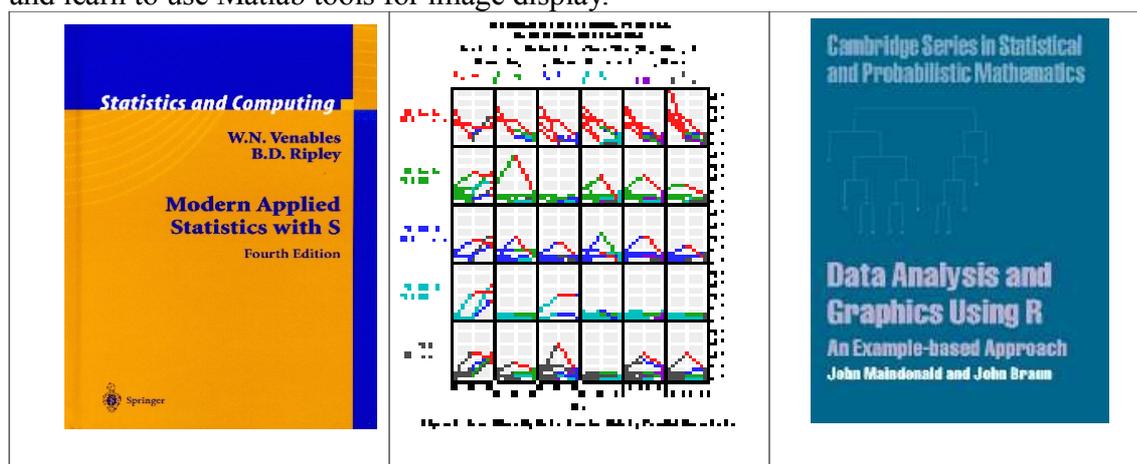
**STAT 823: Statistical Graphics  
Unit Outline - Information for Students**

Please read this unit outline carefully at the start of semester. It contains important information about the unit. If anything in it is unclear, please consult one of the teaching staff.

**ABOUT THIS UNIT**

Stat823 is a four credit point unit offered by the Statistics department in the Division of Economic and Financial Studies. It is offered as part of the Master of Applied Statistics Program and enrolment can be in internal or distance mode.

We present the principles of graphic presentation and apply them in presentation of statistical data sets. Emphasis is given to use of trellis/lattice graphics to present a variety of displays of data and model fits, to display model consistency with data. Course participants create their own web page and learn to use Matlab tools for image display.



Modern applied statistical methods described in the text of Venables and Ripley are introduced at a simplified level. We review, interpret and present results for Poisson and logistic regression and methods for missing data. A goal is effective graphic display of data and model.

To present graphics, we introduce and use S-Plus and R software; for web site development, Visual InterDev; and, for image operations, Matlab. Participants choose an area for further investigation related to their interests. The Unit may be taken as an introduction early in the Master of Applied Statistics program or may serve as a review of the program when taken towards its end.

**SCHEDULE FOR LECTURES & PRACS**

The unit STAT823 is a 4 credit point unit which runs for 13 weeks of classes according to the University calendar, with a term break of two weeks and final exam in Week 15.

	Day	Time	Room
Lectures	Tuesday	6-8 p.m.	C4A 320
Prac	Tuesday	8 p.m.	E4B 208

**TEACHING STAFF**

Unit co-ordinator:

Prof. Malcolm Hudson  
Room: E4A 540  
E-mail: mhudson@efs.mq.edu.au

Lecturer:

Mr Ken Beath  
Room: E4B 308  
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**AIMS**

This course will help prepare students to be active citizens in the information technology age. Students will develop critical thinking skills about how information is visually presented, and they will learn how to accurately and attractively communicate quantitative information using graphics. The unit introduces a range of modern applied statistical techniques, with supporting concepts, and will include applications to a number of practical data sets illustrating the techniques. At the end of the course students will:

- be able to use the computer to generate graphics to communicate information effectively, extending our strategies for assessing, analysing and reporting data;
- translate understanding of statistical models to validate their predictions and effectively present findings using graphic reports in your projects;
- know about important historical and contemporary examples, and the elements of graphical design.

Weekly lab sessions will have a strong 'hands on' orientation.

*Computing*

Students will be gain experience with the use of S-Plus or R for data modelling and graphics.

**RECOMMENDED REFERENCE TEXTS**

Text books you might find useful for the course will be advised in the first lecture, but no text is required. The books of Venables and Ripley and Maindonald and Braun are general references for S-Plus, R and statistical methods covered in our unit. They should prove particularly useful for review following completion of the Unit.

**Texts:**

Venables and Ripley, Modern Applied Statistics with S-Plus, 4th Edition.  
Maindonald and Braun. Data Analysis and Graphics using R.  
S-PLUS, R: online help documentation.

**UNIT WEB PAGE**

Calendar information relating to this unit can be found by visiting the Macquarie University Statistics Department web site. This URL is <http://www.stat.mq.edu.au/units/stat823/>. From there enrolled students can link to Resources. (The initial *username* is 'STAT823' and *password* is 'graphics'). WebCT is used for submitting group exercises and Assignments and for providing notices, solutions and comments. Login to the STAT 823 webCT page from <http://online.mq.edu.au>

**LEARNING OUTCOMES**

By the end of this unit students should be able to:

- critically assess graphics in articles, reports, web pages
- use a high-level object oriented computing language (S-Plus or R) to import data from databases, fit models and prepare effective graphics permitting assessment of the consistency of fitted model with observed data
- prepare suitable graphics for displaying changes over time, multiple variables and multiple groups of observations
- present tables of numbers effectively
- use standard (vector, digitised) representations of images in files
- prepare web project pages or graphic presentations
- gain experience in working effectively in groups

**PRAC CLASSES**

A practical exercise is set each week, to assist students with experience in using related statistical techniques, particularly software, and to create an environment for thinking through issues and encouraging discussion between the students. We allow a 1-hour period during the class hours for this work, which is undertaken in E4B 208.

We form groups for prac and project work on webCT. If you want to change your group, you have to find a student from another group willing to swap with you. Externals will be grouped together.

There are extensive reading materials illustrating use of graphics and statistical methods in analysis of data sets. The statistical systems S-Plus and R are used to demonstrate and develop interactive graphics. A group project is undertaken and presented to the class. The later stage of the unit introduces MATLAB and web page graphics. S-Plus software is available free on CD for internal students for home use. Matlab student editions are available in the bookshop. S-Plus, Matlab and web authoring software are installed for student use in the Advanced Statistics Labs (E4B 208, 302). Weekend and evening access is available to lab E4B 208 (when the lab is not in use for pracs in other units). This entry is by swipe card; see Ms Susan Pe, E4A 538.

**GENERIC SKILLS**

University study aims, not only to provide you with knowledge and skills in a particular academic discipline, but also to equip you with some generic skills. By the end of this unit students should:

- have improved their ability to work co-operatively as a team member
- have enhanced their problem solving ability
- have improved their written communication skills, particularly report writing skills
- have enhanced their critical thinking skills
- be confident in the use of different software packages for solving problems

**TEACHING AND LEARNING STRATEGY**

- Students are expected to attend all classes unless distance precludes this.
- Assignments are individual assessment tasks; if students decide to work in a group, the final outcome should be written individually.
- The project will be prepared as a group and presented by every member of the group.
- If for any reason students can not hand in their assessment tasks on time, they must contact one of the teaching staff.
- A single point of contact on administrative questions is by e-mail to the Lecturer using the webCT Mail tool. Learning questions should first be listed on the Discussions page.

- Internally enrolled students should collect their marked assignments at ERIC (Economic Resource & Information Centre), building E4B. Distance students may receive marked assignments by mail.
- Solutions to prac exercises will not be provided. However the work submitted by the groups is reviewed in the lecture in the week submitted. This discussion can be quite a large component of the evening class. iLectures recordings will be made available on the webCT homepage. Individual help will be shared online in webCT discussions or in office hours listed there.

## ASSESSMENT

Assessment:

3 Assignments	36%
Project & participation	24%
Take home exam	20%
In class exam	20%

*Assignments* are due by the time (usually 9 a.m.) and date specified on the eLearning (webCT) Assignments page (for the current plan see the timetable below) and should be submitted on this page. Group *prac exercises* are due by 9 a.m. Tuesday in the week following the date of issue. Prac work should be submitted as a pdf or Word document attached by mail to me using the webCT Mail.

Your group's *project* is due for presentation in class in week 12. The schedule for group presentations will be determined in week 11.

Your final *in-class* exam will be held on Tuesday 20 November, 6 p.m., in E4B 208. The *take-home* exam is completed on the weekend *before* the in-class exam.

The in-class examination is 'closed book'. You may refer only to two handwritten self-prepared A4 sheet of summary notes (both sides may be used). Calculators are permitted, but may be used only as calculators, and not as storage devices. Mobile phones should be disabled.

**NOTE: To obtain a passing grade, both coursework and exam performance must be satisfactory.**

## WEEKLY READINGS

The Table shows the reference texts from which much of the weekly lecture material is drawn. Referenced articles are provided in Resource Materials distributed to all students.

Shown below are the weekly topics with references to Chapters and pages in these texts.

<i>Week</i>	<i>Topic</i>	<i>Text References &amp; Datasets</i>
1	Table presentation, Ehrenberg's rules, S-Plus tutorial	Rounding, GS 2: Quick Tour <b>Ab births, topcars</b>
2	Data analysis, reports; S-Plus: data and models	Cht 5, 6; VR Ch 2.1, 2.3-2.5, 2.7, 2.9, 2.10; GS Extended Tour; <b>dept, topcars</b>
3	Initial data analysis (IDA); transformations (logs)	Clv 3.1-2; VR 1, 3.1-3.2, 5.2, 5.3
4	Bivariate plots, scatterplot matrix <i>Assignment 1 due</i>	Cht 6.8, Clv 3.5-6, 3.9; UG 3: 74-93, UG 4: 112-146; <b>premium</b>
5	Trellis graphics	Clv 3.10, VR 3.3-3.4, 12.1
6	Advanced trellis graphics	VR 12.1, SueCurtis, jellyfish

7	Linear models, GLMs <i>Assignment 2 due</i>	VR 6.1-3, 7.1-2,7.3*; <b>melanoma</b> ; Project intro
<b>TERM RECESS (2 weeks)</b>		
8	Tables, median polish, additive models; Curve fitting	VR 8.1-2, 8.3*, 14.0; Clv 3.7-8; <b>kittens</b>
9	Missing data <i>Assignment 3 due</i>	Project components
10	Project topics, LME models	
11	Matlab plots	<b>premium data</b>
12	Image data in MATLAB <i>Project presentation</i>	
13	Review	Project due
14	<i>Pick up take home exam</i>	Friday, 16 November
15	<i>Return take home exam; In class exam</i>	Monday, 19 November

**Note:**

1. Data sets we will be using in prac exercises are listed in the third column of this Table.
2. Week numbers are based on the Macquarie University Calendar dates.
3. We will be using S-Plus ( $\geq$  ver 7), which has online manuals (available in PDF files at [http://www.insightful.com/support/doc\\_splus\\_win.asp](http://www.insightful.com/support/doc_splus_win.asp) or from the pulldown menu under Help, once S-Plus is installed on your PC). The User's Guide (*UG*) is obtained by selecting Online Manuals > User Guide from the Help pulldown menu. So *UG 3: 65-79* indicates that the reading is from on-line help, specifically Chapter 3, pages 65-79, of the User's Guide for S-Plus. In case of difficulties finding a topic listed by page number in the S-Plus online manuals, link to the topic from a keyword in the index pages (at the end of the online manual). Clicking on the keyword page number then links you to corresponding page.
4. R is also well documented, follow the link to Manuals at <http://www.r-project.org/>
5. The written report on weekly prac exercises should be submitted by a single member of each group using webCT Discussions – Submit Prac Exercises. Successive reports should be prepared by each group member in turn.
6. Other text readings are coded using the Table of texts following.

	<i>Reference Texts, Abbreviated Names</i>
GS	S-Plus On-line Help/ Getting Started Guide
UG	S-Plus On-line Help/ User's Guide
PG	S-Plus On-line Help/ Programmer's Guide
VR	Venables & Ripley: Modern Applied Statistics with S-Plus, 4th Edition
Clv	Cleveland, WS: The Elements of Graphing Data First edition, 1985 (see also, Second edition, 1994)
Cht	Chatfield, C: Problem Solving: A Statistician's Guide
Tufte	Tufte, ER. The Visual Display Of Quantitative Information, 1983.

Malcolm Hudson  
13/07/07

## Appendix: University Policies

### RELATIONSHIP BETWEEN ASSESSMENT AND LEARNING OUTCOMES

While attendance at classes is important it is only a small proportion of the total workload for the unit: reading, research in the library, working with other students in groups, completing assignments, using the computer and private study are all part of the work involved. At Macquarie it is expected that the average student should spend four hours per week per credit point.

You are expected to present yourself for examination at the time and place designated in the University Examination Timetable.

Non-attendance at the examination will lead to a Fail grade, unless you document illness or unavoidable disruption. This requires lodging an application for Special Consideration. Information about unavoidable disruption and the special consideration process is available at <http://www.reg.mq.edu.au/Forms/APSCon.pdf>

If a Supplementary Examination is granted as a result of the Special Consideration process the examination will be scheduled soon after the conclusion of the official examination period.

You are advised that it is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester that is the final day of the official examination period.

### PLAGIARISM

The University defines plagiarism in its rules: "Plagiarism involves using the work of another person and presenting it as one's own." Plagiarism is a serious breach of the University's rules and carries significant penalties. You must read the University's practices and procedures on plagiarism. These can be found in the *Handbook of Undergraduate Studies* or on the web at: <http://www.student.mq.edu.au/plagiarism/>

The policies and procedures explain what plagiarism is, how to avoid it, the procedures that will be taken in cases of suspected plagiarism, and the penalties if you are found guilty. Penalties may include a deduction of marks, failure in the unit, and/or referral to the University Discipline Committee.

### UNIVERSITY POLICY ON GRADING

Academic Senate has a set of guidelines on the distribution of grades across the range from fail to high distinction. Your final result will include one of these grades plus a standardised numerical grade (SNG).

On occasion your raw mark for a unit (i.e., the total of your marks for each assessment item) may not be the same as the SNG which you receive. Under the Senate guidelines, results may be scaled to ensure that there is a degree of comparability across the university, so that units with the same past performances of their students should achieve similar results.

It is important that you realise that the policy does not require that a minimum number of students are to be failed in any unit. In fact it does something like the opposite, in requiring examiners to explain their actions if more than 20% of students fail in a unit.

The process of scaling does not change the order of marks among students. A student who receives a higher raw mark than another will also receive a higher final scaled mark.

**The grades and what they mean are given as below:**

<b>HD</b>	<b>High Distinction</b>	Denotes a performance that meets all unit objectives in such an exceptional way and with such marked excellence that it deserves the highest level of recognition.
<b>D</b>	<b>Distinction</b>	Denotes performance that clearly deserves a very high level of recognition as an excellent achievement in the unit.
<b>C</b>	<b>Credit</b>	Denotes performance that is substantially better than would normally be expected of competent students in the unit.
<b>P</b>	<b>Pass</b>	Denotes performance that satisfies unit objectives.
<b>PC</b>	<b>Conceded Pass</b>	Denotes performance that meets unit objectives only marginally.
<b>F</b>	<b>Fail</b>	Denotes that a candidate has failed to complete a unit satisfactorily.

For further explanation of the policy see

<http://www.mq.edu.au/senate/MQUonly/Issues/Guidelines2003.doc> or  
<http://www.mq.edu.au/senate/MQUonly/Issues/detailedguidelines.doc>.

## STUDENT SUPPORT SERVICES

Macquarie University provides a range of Academic Student Support Services. Details of these services can accessed at <http://www.student.mq.edu.au>.