



**DIVISION OF ECONOMIC AND FINANCIAL STUDIES**  
**STAT320: MODELLING AND QUALITY MANAGEMENT**

**First Semester, 2005 – E1**

**UNIT OUTLINE**

**Unit convenor:** Dr Tania Prvan

**Prerequisites:** STAT270(P) or STAT271(P) or BIOL235(P) or PSY222(P).

*Students in this unit should 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 in the unit.*

**ABOUT THIS UNIT**

The first module discusses statistical modelling in general and in particular demonstrates the wide applicability of linear models. The emphasis is on practical issues in data analysis using multiple regression models demonstrated by the use of statistical packages for modelling and diagnostic testing.

The second module, Quality Management is concerned with aiding management of organisations to ensure that their process output meets customer requirements. To manage and improve the processes, it is essential that the quality of output be measured, and that the measurements be analysed and interpreted to provide information and process performance. This section will primarily consider statistical methods and techniques that aid in detection of changes in the quality of output brought about, either by unintentional changes in the process, or by a deliberate attempt to improve the process. These will include some or all of the following: control charts, process capability, acceptance sampling, reliability and experimental design.

**Software:**  
Minitab & Microsoft Word.

**TEACHING STAFF**

**Convenor:** Dr Tania Prvan, CSC454, ph: 9850-8561, tprvan@efs.mq.edu.au

**Other lecturers:** Ms Pamela Shaw, CSC467, ph: 9850-8584, pshaw@efs.mq.edu.au

Please note that any communication with staff via email will only be conducted using your official university email address. Other teaching staff and times for consultation hours will be finalised at the end of Week 1. These will be posted on the web site.

Ms Pamela Shaw will be teaching the first six weeks and Dr Tania Prvan will be teaching the next six weeks. The last week of lectures is revision.

**CLASSES**

**Lectures**

Lectures begin in Week 1. Lectures are held on Tuesdays between 6:00pm and 8:00pm and Wednesdays between 6pm and 7pm in room E7B 264.

**Tutorials**

1 x 1 hour tutorial. Tutorials will start in the second week. Weeks 8 to 13 are in the computer laboratory. In weeks 2 to 7 you will be required to prepare material for tutorials and this work will count towards your assessment. In weeks 8 to 12 you will be required to submit the laboratory at the end of the tutorial and this work will also count towards your assessment.

The timetable for classes can be found on the University web site at:  
<http://www.timetables.mq.edu.au/>

**REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS****Prescribed texts**

**Quality Management:** Montgomery, D. C. (2005) *Introduction to Statistical Quality Control, 5<sup>th</sup> Edition*. Wiley, New York; Chichester.  
**Linear Models:** Chatteerjee, S.; Hadi, A.S. & Price, B. (2000) *Regression Analysis by Example (3<sup>rd</sup> Ed)*. Wiley  
**General:** Anderson, J. & Poole, M. (1994) *Thesis and assignment writing*. Wiley.

**Recommended texts:**

**Quality Management:** Mitra, A. (2000) *Fundamentals of Quality Control and Improvement*, Second Edition. Pearson Education, Upper Saddle River, New Jersey. (TS156.M54/1998)  
**Linear Models:** Kleinbaum, D.G., Kupper, L.C., Muller, K.E. & Nizam, A. (1998) *Applied Regression Analysis and other Multivariable Methods*. Duxbury Press, Pacific Grove. (QA278.A665/1998)

**UNIT WEBSITE**

The web page for this unit can be found at: <http://www.stat.mq.edu.au/units/stat320/>.

**LEARNING OUTCOMES**

The learning outcomes of this unit are to

- understand the principles of linear modelling in data analysis and quality management;
- choose the appropriate statistical analysis, for a given data set, from a wide range of methods based on the linear model;
- use a statistical computer package to carry out chosen analyses and interpret the results with understanding; present the results of analyses in a form which is suitable for publication.

In addition to the discipline-based learning objectives, all academic programs at Macquarie seek to develop students' generic skills in a range of areas. One of the aims of this unit is that students develop their skills in the following:

- problem solving skills;
- written communication skills, particularly report writing;
- critical analysis skills.

**TEACHING AND LEARNING STRATEGY**

The unit is taught in traditional mode; that is, on campus in standard semesters with weekly lectures and tutorials (some of which are in the computer laboratory).

Students are expected to

- attend all the lectures and the tutorials;
- prepare their own solutions to selected weekly practical exercises for weeks 2 to 7 and bring them to the tutorial;
- hand in laboratory exercises at the conclusion of the tutorial in weeks 8 to 13;
- contact one of the teaching staff in advance if for any reason, students cannot hand in their assessment tasks on time;
- hand in the assignment and project to ERIC (Economic Resource & Information Centre) C5C244;
- Collect their marked assessment from ERIC (Economic Resource & Information Centre) C5C244.

Refer to end of handout for week-by-week list of topics to be covered.

**RELATIONSHIP BETWEEN LEARNING OUTCOMES**

While attendance at classes is important it is only a small proportion of the total workload for the unit: reading, 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.

The assessment is based on the projects, performance in the tutorials (including homework), class test, assignment, and the final examination.

Assessment	Weighting	Due
Quality Management Project Proposal	2%	4:00pm Friday 18 <sup>th</sup> March
Linear Models Assignment	5%	4:00pm Friday 20 <sup>th</sup> May
Quality Management Project	13%	4:00pm Friday 27 <sup>th</sup> May
Linear Models Test	10%	Week 13 tutorials
Homework and Tutorial Participation	10%	Each weeks tutorial
Final Examination	60%	As timetabled

Marked assessment will be available for collection from ERIC (Economic Resource & Information Centre) C5C244 approximately two weeks after the due date.

**Project:** As part of the project in quality management, you are required to collect daily records over a period of 42 days and analyse them using methods taught in this course.

See the Web site for STAT320 <http://www.stat.mq.edu.au/units/stat320/index.htm> as to how the 42 days includes

- i) 21 days measuring whether the system is in control
- ii) implementing a change in the process
- iii) a further 21 days to see if the change has affected the process.

The project is designed to give you practical experience in collecting suitable data and analysing and reporting on that data in a fashion that can be understood by management. The intention is that you firstly see whether or not the system is in control, and then see whether it is possible to change the parameters of the system to ones that are more favourable to the intended outcome. Details of further work relating to the project will be given in the course. The report is to be handed in to ERIC (Economic Resource & Information Centre) C5C244 by 4pm, Friday 3 June.

*Suggestions for suitable data*

1. Daily measurements of electricity used
2. Daily measurements of water usage.
3. Amount of liquid consumed every day.
4. Time to run 2000m.
5. Daily sales in a shop before and during a birthday sale
6. Comparison of car usage between cricket and off seasons.
7. Internet usage as result of typing emails before logging in.
8. Change in number of phone calls taken in 10 minute period with two different introductory lines: "Good morning, Ashfield Council, how can I help you" and "Good morning, Ashfield Council."

**Your report should be no longer than three pages with all computing output included in an Appendix. Your name, student ID and tutor's name are to appear on the top right hand corner of the cover page.**

You should refer to the book by Anderson and Poole mentioned above for the setting out of your report.

Late assessments will only be accepted with the agreement of the lecturer and may be subject to the deduction of some marks.

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

The University Examination period in First Half Year 2005 is from 5<sup>th</sup> June to 29<sup>th</sup> June.

You are expected to present yourself for examination at the time and place designated in the University Examination Timetable. The timetable will be available in Draft form

approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of the examinations.

<http://www.timetables.mq.edu.au/exam>

The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying 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 after the conclusion of the official examination period. (Individual Divisions may wish to signal when the Division's Supplementaries are normally scheduled.)

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 POSITION ON GRADES**

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.

For an explanation of the policy see <http://www.mq.edu.au/senate/MQOnly/Issues/Guidelines2003.doc> or <http://www.mq.edu.au/senate/MQOnly/Issues/detailedguidelines.doc>.

**STUDENT SUPPORT SERVICES**

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

**CONDITIONS FOR USE OF COMPUTERS LABS**

1. Student Computing Laboratories available to undergraduate students are located in Building C5C, Rooms 211, 213/215, 217, 219.
2. All users of computing facilities within the Division of Economic and Financial Studies are bound by the Computer Usage Rules of the Division and the University's Information Technology Security Policy and Rules, including Conditions of Use Rules (refer <http://www.ois.mq.edu.au/policy/mqrules.htm>).
3. Usage of all student computing facilities within this Division is restricted to authorised coursework for units offered within this Division. At all times, student ID cards must be displayed in the locations provided. Students must comply immediately with all notices posted within the rooms and directions given by University staff, including Student Computing Laboratory Demonstrators.
4. Since student computing facilities are provided to support large numbers of students, please show consideration for your fellow students and treat University equipment with care. In particular,
  - o Keep all computing areas neat and tidy; use facilities provided
  - o Keep noise to a minimum, and avoid all other disruptions
  - o Do not attach, alter or remove hardware of any kind to the equipment provided (including USB storage devices)
  - o Do not change desktop or application configurations
  - o Do not install or remove software or firmware of any kind
  - o Do not download unauthorised material
5. Please note that food or drink is **NOT** permitted in computing areas, and smoking is prohibited within any building on campus.
6. Students must vacate, and not enter, rooms whenever scheduled classes are in progress; imtables of classes are posted on doors. Also, students must evacuate rooms immediately upon instructions given by University staff, including Student Computing Laboratory Demonstrators, or Emergency Services personnel (e.g.: Police, Fire, Ambulance, SES, etc.).
7. Students are responsible for the integrity of their data. Hence, it is important that students maintain independent copies of important files. The University accepts no

responsibility for loss or corruption of files. The University also reserves the right to monitor information stored on its resources and remove unauthorised or inappropriate files.

8. Students working on University premises must comply at all times with the Occupational Health and Safety Act (2000, as amended) and Occupational Health and Safety Regulations (2001, as amended).
9. Breaches to any of the above conditions will result in disciplinary action, without further notice.

During semester these labs are open 8am to 10pm Monday to Friday and 9am to 5pm Saturday to Sunday.

**Unit Schedule**

**WEEK TOPIC AND SUGGESTED READING WORK DUE**

WEEK	TOPIC AND SUGGESTED READING	WORK DUE
1 (28 Feb)	Q: Introduction Discussion of project Variation, Common causes and special causes Control charts for variables. Q: Deming's paradigm Pareto diagrams	
2 (7 Mar)	Control charts for variables Q: Control charts for attributes. Q: Process capability Guest speaker	Project Proposal (2%)
3 (14 Mar)	Q: Reliability	
4 (21 Mar)	Q: Acceptance sampling/Reliability	
5 (28 Mar)	LM: Review of simple and multiple regression	
6 (4 April)	LM: Review of simple and multiple regression including matrix algebra	
7 (11 April)	Chap 1.2, beginning of 3	

**MIDSEMESTER BREAK - 9 APRIL - 26 APRIL**

8 (2 May)	LM: Hypothesis tests Correlations	
9 (9 May)	Chapter 3, §11.1-11.10 LM: Confounding and Interaction Diagnostics	Assignment (5%)
10 (16 May)	LM: Diagnostics ctd 4.12	
11 (23 May)	Categorical Predictors LM: Analysis of Covariance Introduction to Logistic regression	Project (13%)
12 (30 May)	LM: Logistic regression ctd	
13 (6 June)	LM & Q: Summary and revision	Test (10%)

Homework and tutorial participation: Weeks 2 - 13

LM: Modelling component  
Q: Quality management component  
Chapters in LM. refer to Chatterjee et al.