



# STAT270

## Applied Statistics

S2 Evening 2013

*Statistics*

### Contents

---

<u>General Information</u>	2
<u>Learning Outcomes</u>	2
<u>Assessment Tasks</u>	3
<u>Delivery and Resources</u>	6
<u>Unit Schedule</u>	8
<u>Policies and Procedures</u>	10
<u>Graduate Capabilities</u>	11
<u>Changes since First Published</u>	16

---

#### **Disclaimer**

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

## General Information

Unit convenor and teaching staff

Unit Convenor

Peter Petocz

[peter.petocz@mq.edu.au](mailto:peter.petocz@mq.edu.au)

Contact via [peter.petocz@mq.edu.au](mailto:peter.petocz@mq.edu.au)

Credit points

3

Prerequisites

[(STAT170(P) or STAT171(P)) and (STAT175(P) or GPA of 1.50)] or admission to GradCertSc

Corequisites

Co-badged status

Unit description

This unit aims to extend and broaden statistical experience from 100-level statistics units. It focuses on relationships between categorical or continuous explanatory variables and a continuous response variable using the techniques of one-way and two-way analysis of variance and simple and multiple linear regression. Data management, graphical presentation of results, and power analysis are also investigated. The unit has a strong practical component built around a substantial collaborative project planned and carried out during the semester, and graduate capabilities such as communication, teamwork, problem solving and ethics are addressed in this context.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

Discuss the role of independent (predictor) and dependent (response) variables and distinguish between categorical and quantitative variables.

Formulate a research question and select an appropriate statistical model for investigating it (from the range of models studied in this unit)

Understand and appreciate the ethical aspects of carrying out statistical research and

analysis.

Plan and organise the collection of appropriate data, and manage these data electronically.

Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.

Understand the assumptions underlying these statistical methods and decide whether they are reasonable in any particular case.

Use standard statistics packages to carry out these analyses.

Communicate clearly the results from these statistical analyses and relate these results to the original research question.

## Assessment Tasks

Name	Weighting	Due
<u>Class Test</u>	10%	Week 6
<u>Project-group</u>	25%	Week 11
<u>Project-individual</u>	10%	Week 12
<u>Project-presentation</u>	5%	Week 13
<u>Final Examination</u>	50%	University Examination Period

### Class Test

Due: **Week 6**

Weighting: **10%**

A short class test will be held in week 6, after the presentation of the basic material. It will give you a good indication of how well prepared you are for the rest of the unit. Should you be sick or miss the test (with appropriate documentation), the percentage allocated to the test will be moved to the final exam (so your exam would then be worth 60%).

On successful completion you will be able to:

- Discuss the role of independent (predictor) and dependent (response) variables and distinguish between categorical and quantitative variables.
- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.
- Understand the assumptions underlying these statistical methods and decide whether they are reasonable in any particular case.

- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

## Project-group

Due: **Week 11**

Weighting: **25%**

The project is an essential component of this unit. Since it represents a substantial piece of work, we will provide several opportunities for you to get feedback on it. First, you need to get your lecturer's approval of your project proposal before you start collecting any data. Second, you can ask questions about your project from your tutor or lecturer at any time during the process. Third, you can ask your tutor or lecturer for comments on a draft of your project during the week before it is due. Finally, if your submitted project is not quite satisfactory, you will have an opportunity to revise it. You will be asked to sign (or modify) a statement saying that all members of the group have contributed equally.

On successful completion you will be able to:

- Discuss the role of independent (predictor) and dependent (response) variables and distinguish between categorical and quantitative variables.
- Formulate a research question and select an appropriate statistical model for investigating it (from the range of models studied in this unit)
- Understand and appreciate the ethical aspects of carrying out statistical research and analysis.
- Plan and organise the collection of appropriate data, and manage these data electronically.
- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.
- Understand the assumptions underlying these statistical methods and decide whether they are reasonable in any particular case.
- Use standard statistics packages to carry out these analyses.
- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

## Project-individual

Due: **Week 12**

Weighting: **10%**

Each student will be asked to submit an individual analysis and reflection on their project and on the process of carrying it out. This will give you an opportunity to discuss any problems you may have had, and to highlight any particularly successful features. You will also be asked about your

specific contribution to the project. A short form will be available for this analysis and reflection.

On successful completion you will be able to:

- Understand and appreciate the ethical aspects of carrying out statistical research and analysis.
- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.
- Understand the assumptions underlying these statistical methods and decide whether they are reasonable in any particular case.
- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

## Project-presentation

Due: **Week 13**

Weighting: **5%**

Each group will be asked to make a short presentation of their project during the last week of classes. You will get more details about this later (the time allocation depends on the number of projects). The same mark will be allocated for all group members, as long as they have participated (approximately) equally in the presentation. Externally enrolled students can make their presentation using an electronic format (I'll suggest some options).

On successful completion you will be able to:

- Understand and appreciate the ethical aspects of carrying out statistical research and analysis.
- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.
- Use standard statistics packages to carry out these analyses.
- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

## Final Examination

Due: **University Examination Period**

Weighting: **50%**

The final examination will cover the material studied in the whole unit and address all the unit outcomes. You may take one A4 sheet, handwritten on both sides, into the final examination. You must perform satisfactorily in the final examination in order to pass the unit regardless of your performance throughout the semester. If you fail the final examination, your overall result will be the minimum of your coursework and final exam mark (%).

On successful completion you will be able to:

- Discuss the role of independent (predictor) and dependent (response) variables and distinguish between categorical and quantitative variables.
- Formulate a research question and select an appropriate statistical model for investigating it (from the range of models studied in this unit)
- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.
- Understand the assumptions underlying these statistical methods and decide whether they are reasonable in any particular case.
- Use standard statistics packages to carry out these analyses.
- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

## Delivery and Resources

### Classes

Times and locations for all classes can be found on the University web site at: [www.timetables.mq.edu.au](http://www.timetables.mq.edu.au)

Lectures: You are required to attend 3 x 1 hour lectures each week, beginning in Week 1.

Tutorials: You are required to attend 1 x 1 hour tutorial each week, beginning in Week 2.

### Required and Recommended Texts and/or Materials

We will be using material from several online textbooks:

**SurfStat** at <http://surfstat.anu.edu.au/surfstat-home/surfstat.html> is a complete introductory statistics course, with a useful section on Statistical Inference with a sub-section on correlation and regression (but no ANOVA). **HyperStat** Online at <http://davidmlane.com/hyperstat/index.html> is at an intermediate level, chapter 12 and first part of 13, and chapter 15 cover the material (with background in chapter 1). Chapter 5 contains the best online table of the normal distribution (see [http://davidmlane.com/hyperstat/normal\\_distribution.html](http://davidmlane.com/hyperstat/normal_distribution.html) - try it!) **StatSoft** Electronic Textbook at <http://www.statsoft.com/textbook/stathome.html> is more advanced, and material is covered in sections called ANOVA/MANOVA and Linear Regression (with Elementary Concepts and Basic Statistics for background).

You may prefer a physical textbook: the material is covered in chapters 10–13 of D. Moore, G. McCabe & B. Craig (2012), *Introduction to the Practice of Statistics*, 7<sup>th</sup> Edition, W.H. Freeman. This book (and many others) provides lots of good explanations and examples, and includes a useful summary of earlier material required by this course. I prefer not to make its use compulsory, but it is available from the Co-op Bookshop (or elsewhere), and any previous edition (by these three authors or by Moore & McCabe) is equally useful.

Other references:

Moore, D.S., McCabe, G. P. and Craig, B.A. (2012) *Introduction to the Practice of*

Statistics, Seventh Edition (W.H. Freeman) HIGHLY RECOMMENDED

De Veaux, R.D., Velleman, P.F. and Bock, D.E. (2004) Stats Data and Models (Pearson) HIGHLY RECOMMENDED

Ramsay, F.L. and Schafer, D.W. (2002) The Statistical Sleuth (Wadsworth) HIGHLY RECOMMENDED

Anderson, J. and Poole, M. (2002) Thesis and Assignment Writing (Wiley)

Chatterjee, S. Hadi, A. and Price, B. (2006) Regression Analysis By Example (Wiley)

Devore, J. and Peck, R (2005) Statistics The Exploration and Analysis of Data (Brooks/Cole)

Ryan, B.F. , Joiner, B.L. and Cryer, J.D. (2005) Minitab Handbook (Duxbury)

Utts, J.M. and Heckard, R. F. (2004) Mind on Statistics, (Duxbury Press)

Utts, J.M. and Heckard, R. F. (2006) Statistical Ideas and Methods, (Duxbury Press)

Calculators: Although the course will not focus on calculations, you will need to have (and be able to use) a calculator with statistical mode for the final examination (the one you used for your first-year unit in statistics will be fine).

Computing:

The statistical software Minitab version 16 will be the main package used, and is installed in the computer labs used for classes. In addition, we will be using a software package called Arc.

As a Macquarie student, you can obtain a copy of Minitab for home use, downloaded from the student portal from the tab labelled 'software downloads'. This location gives details of how to download and install the package onto your machine. Arc is also available as a free download from <http://www.stat.umn.edu/arc/> (I'll give more details when we start to use it). We will also occasionally use other (free) software packages, to illustrate particular points

## Technology Used and Required

### Unit Web Page

Navigate from [http://www.stat.mq.edu.au/undergraduate\\_programs/stat\\_units/stat\\_units200/stat270/](http://www.stat.mq.edu.au/undergraduate_programs/stat_units/stat_units200/stat270/) and <http://ilearn.mq.edu.au/>

This unit will have a Discussions forum, iLectures and other material available online through the University's Online Teaching Facility, iLearn. A link will be available through the Stat270 web page, as well as from [ilearn.mq.edu.au](http://ilearn.mq.edu.au). Use your student ID number and your myMQ Student Portal Password to access the site. Consult the web page and Discussions forum frequently (at least once a week). Useful guides on using the Online Teaching Facility are also available at this site.

## Teaching and Learning Strategy

Students in Stat270 will attend 3 x 1 hour lectures and 1x 1 hour tutorial.

Lectures begin in week 1 with an overview of the unit and an introduction to the most important ideas.

Lectures in weeks 2-5 will present an overview of the range of techniques that we will be using. During weeks 6-11, while you are working on your project, lectures will focus on important aspects of the process of statistical investigation. The last two weeks will be used for summary and revision lectures.

Tutorial classes begin in week 2 and are designed to complement the work discussed in the lectures: they are **not optional**, and will form an essential part of your learning process. Some classes are held in tutorial mode, working on problems and discussing their solutions. Others are held in a computing lab to allow you to practise techniques learnt in lectures using prepared worksheets.

All lecture and tutorial material will be available on iLearn: you may print such material in advance and bring it to classes, or you may load it onto your iPad or laptop computer and bring that along.

At Macquarie University it is expected that the average student would spend approximately 3 - 4 hours per week for each credit point in a unit. This means that for Stat270 you should expect to spend approximately 9-12 hours per week in both formal classes and independent work.

## Unit Schedule

### Stat270 Applied Statistics

#### Unit Schedule Semester 2, 2013

Date (Mon)	Wk	Lecture (E5A 230)	Tut/Lab (E8A 188/???)
29 July	1	Introduction – types of variables, relationships, planning and running a statistical investigation	<i>(collect data by questionnaire – in first lecture – to use during future lectures)</i>
5 Aug	2	Summary: one-way anova, types of hypotheses, assumptions, graphics	Tut: research question, planning the study – variables and subjects



12 Aug	3	Summary: simple linear regression, transforming variables, assumptions, graphics	Lab: graphics and analysis of given data using computer package Minitab
19 Aug	4	Summary: multiple linear regression, indicator variables	Tut: questions using one-way anova and SLR
26 Aug	5	Summary: two-way anova	Lab: graphics and analysis of given data using computer package Arc
2 Sept	6	<b><i>In-class test (10%) – first 30 mins</i></b> Ethical aspects; Data collection, cleaning and management	Tut: questions using two-way anova and MLR <b><i>Project sign-off by end of week</i></b>
9 Sept	7	Graphical tools in modelling	Lab: data management from Excel to Minitab and Arc
16 Sept		Mid-semester break	
23 Sept		Mid-semester break	
30 Sept	8	Statistical evidence – hypotheses	Lab: summarising data graphically, graphical justification of assumptions

7 Oct	9	(Monday public holiday)	<b>First draft of project for comment by end of week</b>
14 Oct	10	Communicating results – reports	Tut: hypothesis tests in modelling
21 Oct	11	Statistical power	Tut/Lab: (work on own project, tutor available) <b>Project due Friday (25%)</b>
28 Oct	12	Anova-regression connection	Lab: power and sample size <b>Individual analysis due Friday (10%)</b>
4 Nov	13	<b>Project presentations (5%)</b>  <i>Marked projects returned</i>	Tut: previous exam questions  <b>(Final exam 50% - during exam period)</b>

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy [http://www.mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://www.mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy <http://www.mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://www.mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://www.mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy [http://mq.edu.au/policy/docs/grievance\\_management/policy.html](http://mq.edu.au/policy/docs/grievance_management/policy.html)

Special Consideration Policy [http://www.mq.edu.au/policy/docs/special\\_consideration/policy.html](http://www.mq.edu.au/policy/docs/special_consideration/policy.html)

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

## Student Support

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

### UniWISE provides:

- Online learning resources and academic skills workshops [http://www.students.mq.edu.au/support/learning\\_skills/](http://www.students.mq.edu.au/support/learning_skills/)
- Personal assistance with your learning & study related questions.
- The Learning Help Desk is located in the Library foyer (level 2).
- Online and on-campus orientation events run by Mentors@Macquarie.

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

Details of these services can be accessed at <http://www.student.mq.edu.au/ses/>.

## IT Help

If you wish to receive IT help, we would be glad to assist you at <http://informatics.mq.edu.au/help/>.

When using the university's IT, you must adhere to the [Acceptable Use Policy](#). The policy applies to all who connect to the MQ network including students and it outlines what can be done.

## Graduate Capabilities

### Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

### Learning outcomes

- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.
- Understand the assumptions underlying these statistical methods and decide whether

they are reasonable in any particular case.

- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

## Assessment tasks

- Project-group
- Project-individual
- Project-presentation
- Final Examination

## Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

## Learning outcomes

- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.
- Understand the assumptions underlying these statistical methods and decide whether they are reasonable in any particular case.
- Use standard statistics packages to carry out these analyses.
- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

## Assessment tasks

- Project-group
- Project-individual
- Project-presentation

## Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

## Learning outcomes

- Discuss the role of independent (predictor) and dependent (response) variables and distinguish between categorical and quantitative variables.
- Plan and organise the collection of appropriate data, and manage these data electronically.
- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.
- Understand the assumptions underlying these statistical methods and decide whether they are reasonable in any particular case.
- Use standard statistics packages to carry out these analyses.

## Assessment tasks

- Class Test
- Project-group
- Final Examination

## Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

## Learning outcomes

- Formulate a research question and select an appropriate statistical model for investigating it (from the range of models studied in this unit)
- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.

## Assessment tasks

- Class Test
- Project-group
- Project-individual
- Final Examination

## Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

### Learning outcome

- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.

### Assessment tasks

- Class Test
- Project-group
- Project-individual
- Final Examination

## Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

### Learning outcomes

- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.
- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

### Assessment tasks

- Project-group
- Project-individual
- Project-presentation

## Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess,

write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

### **Learning outcomes**

- Apply and interpret the statistical methods covered in this unit to analyse data and provide answers to a research question.
- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

### **Assessment tasks**

- Project-group
- Project-individual
- Project-presentation
- Final Examination

## **Engaged and Ethical Local and Global citizens**

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

### **Learning outcomes**

- Understand and appreciate the ethical aspects of carrying out statistical research and analysis.
- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

### **Assessment tasks**

- Project-group
- Project-individual
- Project-presentation

## **Socially and Environmentally Active and Responsible**

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active

participants in moving society towards sustainability.

This graduate capability is supported by:

### Learning outcome

- Communicate clearly the results from these statistical analyses and relate these results to the original research question.

### Assessment tasks

- Project-group
- Project-individual
- Project-presentation

## Changes since First Published

Date	Description
22/11/2012	The Prerequisites was updated.