



# STAT680

## Applied Statistics

S1 Day 2015

*Dept of Statistics*

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## General Information

Unit convenor and teaching staff

Unit Convenor

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E4A526

Wednesday 2-4

Lecturer

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E4A532

Wednesday 10-12pm

Credit points

4

Prerequisites

Admission to MAppStat or GradDipAppStat

Corequisites

STAT670

Co-badged status

STAT270

Unit description

This unit aims to extend and broaden statistical experience from STAT670. 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:

Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries

Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.

Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.

Interpret statistical results and summarise the results in a statistical report.

Apply statistical software packages in data analysis.

Be able to describe the types of missing data and simple solutions and their limitations.

## General Assessment Information

Note that satisfactory performance in the final exam is required for a pass in the subject.

## Assessment Tasks

Name	Weighting	Due
<a href="#"><u>Tutorial Exercises Week 3</u></a>	4%	18 March
<a href="#"><u>Assignment 1</u></a>	11%	22 April
<a href="#"><u>Assignment 2</u></a>	15%	3 June
<a href="#"><u>Statistics Report</u></a>	10%	10 June
<a href="#"><u>Final exam</u></a>	60%	to be decided

### Tutorial Exercises Week 3

Due: **18 March**

Weighting: **4%**

Tutorial Exercises from Week 3

On successful completion you will be able to:

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for

various types of data. Models include one and two way ANOVA, simple and multiple regression.

- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.

## Assignment 1

Due: **22 April**

Weighting: **11%**

Covers weeks 1-6

On successful completion you will be able to:

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.

## Assignment 2

Due: **3 June**

Weighting: **15%**

Covers weeks 7-12

On successful completion you will be able to:

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.

## Statistics Report

Due: **10 June**

Weighting: **10%**

More advanced statistical work.

On successful completion you will be able to:

- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.
- Be able to describe the types of missing data and simple solutions and their limitations.

## Final exam

Due: **to be decided**

Weighting: **60%**

Content to be advised. Satisfactory performance is required for a pass in the subject.

On successful completion you will be able to:

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.
- Be able to describe the types of missing data and simple solutions and their limitations.

## Delivery and Resources

### Textbook

There is no prescribed textbook.

### Software

You will be expected to use MINITAB to perform data analyses. We will use Minitab during the tutorials, and you can use the software in the E4B labs when they are not booked for classes. You can find more information on Minitab at their web site: <http://www.minitab.com>. A free copy is available to Macquarie students. From the student portal <http://students.mq.edu.au/home/> go to Software Downloads (top right) and follow the instructions for Minitab.

## Additional References

These are available in Reserve.

Moore, D.S., McCabe, G. P. and Craig, B.A. (2014) Introduction to the Practice of Statistics, Eighth 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)

## 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).

## Unit Schedule

Week (begins)	Lectures	Work due
1 (23 Feb)	Review One sample tests + One sided tests	
2 (2 March)	Review two sample tests + assumptions; Report writing	
3 (9 March)	One way ANOVA	
4 (16 March)	One way ANOVA Multiple comparisons	

5 (23 March)	Transformations, and Non-parametrics; Power and Sample Size	
6 (30 March)	Data collection and management	
	Midsemester Break	
7 (20 April)	Simple linear regression and transformations	Assn 1
8 (27 April)	Multiple regression	
9 (4 May)	Multiple regression continued; Ethics	
10 (11 May)	Two-way ANOVA	
11 (18 May)	Two-way ANOVA continued and Multiple comparisons	
12 (25 May)	ANOVA - Regression connection	
13 (1 June)	Revision	Assn 2

Report due in week beginning 8 June.

## 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://mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

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

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

Grade Appeal Policy <http://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)

Disruption to Studies Policy [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html) *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

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

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: [https://students.mq.edu.au/support/student\\_conduct/](https://students.mq.edu.au/support/student_conduct/)

## Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](#).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## 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

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit <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.

## Late Submission

Late submission of assignments will be only accepted by prior arrangement or in accordance with the special consideration policy. All other late submissions will incur a penalty of 10% per day or part day.

## 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**

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.

## **Assessment tasks**

- Tutorial Exercises Week 3
- Assignment 1
- Assignment 2
- Statistics Report
- Final exam

## **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**

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.

- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.
- Be able to describe the types of missing data and simple solutions and their limitations.

## Assessment tasks

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- Statistics Report
- Final exam

## 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

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
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## Assessment tasks

- Tutorial Exercises Week 3
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- Assignment 2
- Statistics Report

- Final exam

## 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 outcomes

- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.
- Be able to describe the types of missing data and simple solutions and their limitations.

### Assessment tasks

- Tutorial Exercises Week 3
- Statistics Report

## 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 outcome

- Interpret statistical results and summarise the results in a statistical report.

### Assessment tasks

- Assignment 1
- Assignment 2