



# STAT680

## Applied Statistics

S1 Day 2019

*Dept of Mathematics and Statistics*

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## General Information

Unit convenor and teaching staff

Unit Co-Convenor & Lecturer

Nicole Mealing

[nicole.mealing@mq.edu.au](mailto:nicole.mealing@mq.edu.au)

Contact via (02) 9850 9174

Room 609, Level 6, 12 Wally's Walk

See iLearn for consultation hours

Unit Co-Convenor

Justin Wishart

[justin.wishart@mq.edu.au](mailto:justin.wishart@mq.edu.au)

Contact via (02) 9850 4749

Room 705, Level 7, 12 Wally's Walk

See iLearn for consultation hours

Credit points

4

Prerequisites

Admission to MAppStat or GradCertAppStat or GradDipAppStat or MSc or MDataSc or MLabQAMgt or GradDipLabQAMgt or GradCertLabQAMgt or MSclInnovation

Corequisites

STAT670

Co-badged status

Unit description

This unit aims to extend and broaden statistical experience from STAT670, with a focus on application to real-world analysis. It covers 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, report writing, graphical presentation of results, and power analysis are described.

## 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:

Produce and interpret appropriate visual displays and numerical summaries.

Understand and apply appropriate statistical methods and models to provide answers to research questions. Models include one-way ANOVA, two-way ANOVA, simple linear regression, and multiple regression.

Understand the assumptions underlying the models, and how they can be checked and, if invalid, how to modify the analysis.

Use statistical software to fit the models and interpret statistical software output appropriately.

Understand and apply the nonparametric regression method of kernel smoothing for data where simple linear and multiple regression methods are inappropriate.

## General Assessment Information

### Census dates

The last day to withdraw from this unit without financial or academic penalty is March 21. The last date to withdraw from this unit without academic penalty is April 28.

### Software

The supported statistical software for this unit is R/RStudio. Students will be given guidance on how to use this software and be expected to conduct their analyses using R/RStudio for the in-session assessments. Students should also note that the mid-semester exam and final examination will involve data analysis that contains inline R code that students need to interpret to answer the exam questions.

### Serious and unavoidable disruption to studies and special consideration

Late submissions, extensions to assessment due dates or alternative assessments are not possible unless a student experienced a **serious and unavoidable** disruption to their studies or had a documented illness. In this case, students are required to notify the Faculty on the [ask.mq.edu.au](https://ask.mq.edu.au) system and apply for special consideration. This special consideration process needs to be approved before any alternative assessment is offered.

### Specific late assessment submission/completion policies

All assignments and assessment tasks must be submitted by the official due date and time. No marks will be given for late work unless an extension has been granted following a successful application for Special Consideration. Please contact the unit convenor for advice as soon as you become aware that you may have difficulty meeting any of the assignment deadlines.

### Final Exam policy

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.

The only excuse for not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these special circumstances you may apply for special consideration via [ask.mq.edu.au](http://ask.mq.edu.au).

If you receive [special consideration](#) for the final exam, a supplementary exam will be scheduled. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the [policy](#) prior to submitting an application. You can check the supplementary exam information page on FSE101 in iLearn ([bit.ly/FSESupp](http://bit.ly/FSESupp)) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

If you apply for Special Consideration for the final examination, you must make yourself available for the Supplementary Examination as organised by the Faculty of Science & Engineering. If you are not available at that time, there is no guarantee that an additional examination time will be offered. Specific examination dates and times will be determined at a later date.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">iLearn Quiz</a>	10%	No	Week 4
<a href="#">Mid-Semester Exam</a>	20%	No	Week 7 SGTA class
<a href="#">Assignment</a>	20%	No	Week 11
<a href="#">Final Exam</a>	50%	No	Examination period

### iLearn Quiz

Due: **Week 4**

Weighting: **10%**

The quiz will become available in Week 3 and due in Week 4. The duration of the quiz will be 60 minutes. The exercises will assess the material covered in Weeks 1-2 of lectures (material covered in SGTA classes held in weeks 2-3) and your ability to use statistical software to conduct statistical analyses.

Note that, the last day to withdraw from this unit without financial or academic penalty is March 21.

On successful completion you will be able to:

- Produce and interpret appropriate visual displays and numerical summaries.

- Understand and apply appropriate statistical methods and models to provide answers to research questions. Models include one-way ANOVA, two-way ANOVA, simple linear regression, and multiple regression.
- Understand the assumptions underlying the models, and how they can be checked and, if invalid, how to modify the analysis.
- Use statistical software to fit the models and interpret statistical software output appropriately.

## Mid-Semester Exam

Due: **Week 7 SGTA class**

Weighting: **20%**

In your Week 7 Small Group Teaching Activity (SGTA) class you will sit an exam. The exam will be conducted under exam conditions, that is, silently and with no communication between students. You may bring in a single page of A4 handwritten notes. The exam will cover material from Weeks 1-5 of lectures (SGTA classes held in weeks 2-6).

Note that, the last date to withdraw from this unit without academic penalty is April 28.

On successful completion you will be able to:

- Produce and interpret appropriate visual displays and numerical summaries.
- Understand and apply appropriate statistical methods and models to provide answers to research questions. Models include one-way ANOVA, two-way ANOVA, simple linear regression, and multiple regression.
- Understand the assumptions underlying the models, and how they can be checked and, if invalid, how to modify the analysis.
- Use statistical software to fit the models and interpret statistical software output appropriately.

## Assignment

Due: **Week 11**

Weighting: **20%**

The Assignment will be due in Week 11. The assignment will cover all learning outcomes and focus on the material covered in lectures from Weeks 6-9 (SGTA classes held in weeks 7-10) and the additional nonparametric regression material that will be available on iLearn.

On successful completion you will be able to:

- Produce and interpret appropriate visual displays and numerical summaries.
- Understand and apply appropriate statistical methods and models to provide answers to

research questions. Models include one-way ANOVA, two-way ANOVA, simple linear regression, and multiple regression.

- Understand the assumptions underlying the models, and how they can be checked and, if invalid, how to modify the analysis.
- Use statistical software to fit the models and interpret statistical software output appropriately.
- Understand and apply the nonparametric regression method of kernel smoothing for data where simple linear and multiple regression methods are inappropriate.

## Final Exam

Due: **Examination period**

Weighting: **50%**

The Final Examination will be a two hour written exam (plus ten minutes reading time) and will be held during the examination period. The relevant statistical tables will be attached to the examination paper. Students will be permitted to take **one A4 sheet, handwritten** into the final examination. This sheet can be one-sided or two sided. This sheet **must** be submitted with your final exam paper at the conclusion of the final exam. The final exam will assess all the topics of STAT270, but mainly lecture weeks 6-13 (SGTA classes held in weeks 8-13).

The University Examination 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.

On successful completion you will be able to:

- Produce and interpret appropriate visual displays and numerical summaries.
- Understand and apply appropriate statistical methods and models to provide answers to research questions. Models include one-way ANOVA, two-way ANOVA, simple linear regression, and multiple regression.
- Understand the assumptions underlying the models, and how they can be checked and, if invalid, how to modify the analysis.
- Use statistical software to fit the models and interpret statistical software output appropriately.

## Delivery and Resources

### Textbook

There is no prescribed textbook.

### Software

You are required to use R/RStudio to perform data analyses. You will use R/RStudio as part of

the SGTA classes, and you can use the software in the E4B labs when they are not booked for classes. You can find more information on RStudio at their web site: <https://www.rstudio.com/>. The software is freely available to download at no cost for all standard operating systems (Windows, Mac OS and Linux) at <https://www.rstudio.com/products/rstudio/download/>.

## Additional References

These recommended books are available in Reserve at the library.

- Moore, D.S., McCabe, G. P. and Craig, B.A. (2017) Introduction to the Practice of Statistics, Ninth Edition (W.H. Freeman)

## Unit Schedule

Week (begins)	Lectures	Work due
1 (25 Feb)	Course introduction; One-sided tests; Type I and Type II error; Introduction to R/RStudio	
2 (4 Mar)	Modified two-sample t-test; Assessing normality and equal variance assumptions	
3 (11 Mar)	One-way ANOVA	
4 (18 Mar)	One-way ANOVA and multiple comparisons	iLearn quiz
5 (25 Mar)	Transformations; Non-parametric tests; Power; Sample Size	
6 (1 Apr)	Data management; R Markdown; Simple linear regression	
7 (8 Apr)	Simple linear regression and model validation; Multiple regression	Mid Semester Exam
	<i>Mid-Semester Break</i>	
8 (29 Apr)	Multiple regression and model validation	
9 (6 May)	Extensions and examples of multiple regression	
10 (13 May)	Two-way ANOVA	
11 (20 May)	Two-way ANOVA and multiple comparisons	Assignment
12 (27 May)	Two-Way ANOVA and multiple regression connection	
13 (3 Jun)	Revision	

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-centr](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-centr)

al). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway](https://students.mq.edu.au/support/study/student-policy-gateway) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) 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](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@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)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## 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

- Produce and interpret appropriate visual displays and numerical summaries.
- Understand and apply appropriate statistical methods and models to provide answers to research questions. Models include one-way ANOVA, two-way ANOVA, simple linear regression, and multiple regression.
- Understand the assumptions underlying the models, and how they can be checked and, if invalid, how to modify the analysis.
- Use statistical software to fit the models and interpret statistical software output appropriately.

### Assessment tasks

- iLearn Quiz
- Mid-Semester Exam
- Assignment
- 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

- Produce and interpret appropriate visual displays and numerical summaries.
- Understand and apply appropriate statistical methods and models to provide answers to research questions. Models include one-way ANOVA, two-way ANOVA, simple linear regression, and multiple regression.
- Understand the assumptions underlying the models, and how they can be checked and, if invalid, how to modify the analysis.
- Use statistical software to fit the models and interpret statistical software output appropriately.
- Understand and apply the nonparametric regression method of kernel smoothing for data where simple linear and multiple regression methods are inappropriate.

### Assessment tasks

- iLearn Quiz
- Mid-Semester Exam
- Assignment
- 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

- Produce and interpret appropriate visual displays and numerical summaries.
- Understand and apply appropriate statistical methods and models to provide answers to

research questions. Models include one-way ANOVA, two-way ANOVA, simple linear regression, and multiple regression.

- Understand the assumptions underlying the models, and how they can be checked and, if invalid, how to modify the analysis.
- Use statistical software to fit the models and interpret statistical software output appropriately.
- Understand and apply the nonparametric regression method of kernel smoothing for data where simple linear and multiple regression methods are inappropriate.

## Assessment tasks

- iLearn Quiz
- Mid-Semester Exam
- Assignment
- 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

- Understand and apply appropriate statistical methods and models to provide answers to research questions. Models include one-way ANOVA, two-way ANOVA, simple linear regression, and multiple regression.
- Understand the assumptions underlying the models, and how they can be checked and, if invalid, how to modify the analysis.
- Use statistical software to fit the models and interpret statistical software output appropriately.
- Understand and apply the nonparametric regression method of kernel smoothing for data where simple linear and multiple regression methods are inappropriate.

## Assessment tasks

- iLearn Quiz
- Mid-Semester Exam
- Assignment

- Final Exam

## 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

- Understand and apply the nonparametric regression method of kernel smoothing for data where simple linear and multiple regression methods are inappropriate.

## Changes from Previous Offering

Reduction of lectures from 3 to 2 hours per week.