



# STAT270

## Applied Statistics

S2 Evening 2019

*Dept of Mathematics and Statistics*

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### Disclaimer

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## General Information

Unit convenor and teaching staff

Unit Convenor & Lecturer

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Credit points

3

Prerequisites

STAT170(P) or STAT171 or STAT150

Corequisites

Co-badged status

Unit description

This unit aims to extend and broaden statistical experience from 100-level statistics units, 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.
- Demonstrate foundational learning skills including active engagement in their learning process.

## General Assessment Information

**HURDLES:** Participation in Small Group Teaching Activities (SGTA) is **compulsory**.

Participation will be assessed by observation of students' work during classes or through submission of work completed during the SGTA. Participation and reasonable engagement in the class activities in at least 10 out of 12 of the SGTA classes are requirements to pass the unit. This is a hurdle requirement.

**ATTENDANCE and PARTICIPATION:** Please contact the unit convenor as soon as possible if you have difficulty attending and participating in any classes. There may be alternatives available to make up the work. If there are circumstances that mean you miss a class, you can apply for a Special Consideration.

**ASSIGNMENT SUBMISSION:** Assignment submission will be online through the iLearn page.

Submit assignments online via the appropriate assignment link on the iLearn page. A personalised cover sheet is not required with online submissions. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration.

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- Please note the quick guide on how to upload your assignments provided on the iLearn page.
- Please make sure that each page in your uploaded assignment corresponds to only one A4 page (do not upload an A3 page worth of content as an A4 page in landscape). If you are using an app like Clear Scanner, please make sure that the photos you are using are clear and shadow-free.
- It is your responsibility to make sure your assignment submission is legible.
- If there are technical obstructions to your submitting online, please email us to let us know.

You may submit as often as required prior to the due date/time. Please note that each submission will completely replace any previous submissions. It is in your interests to make frequent submissions of your partially completed work as insurance against technical or other problems near the submission deadline.

**LATE SUBMISSION OF WORK:** All assignments or assessments must be submitted by the official due date and time. No marks will be given to 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. It is in your interests to make frequent submissions of your partially completed work. Note that later submissions completely replace any earlier submission, and so only the final submission made before the due date will be marked.

**FINAL EXAM POLICY:** 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](https://ask.mq.edu.au).

#### **SUPPLEMENTARY EXAMINATIONS:**

**IMPORTANT:** If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. If you apply for special consideration, you must give the supplementary examination priority over any other pre-existing commitments, as such commitments will not usually be considered an acceptable basis for a second application for special consideration. 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 (<https://bit.ly/FSESupp>) for dates, and approved applicants will receive an individual notification sometime in the week prior to the exam with the exact date and time of their supplementary examination.

## **Census dates**

The last day to withdraw from this unit without financial or academic penalty is August 22. The last date to withdraw from this unit without academic penalty is September 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 test and final examination will involve data analysis that contains inline R code that students need to interpret to answer the exam questions.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">SGTA Participation</a>	0%	Yes	During SGTA classes
<a href="#">iLearn Quiz</a>	10%	No	Week 4
<a href="#">Mid-Semester Test</a>	20%	No	Week 7 SGTA class
<a href="#">Assignment</a>	20%	No	Week 12
<a href="#">Final Exam</a>	50%	No	Formal Examination period

### SGTA Participation

Due: **During SGTA classes**

Weighting: **0%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

Students must *actively* participate in at least 10 out of 12 Small Group Teaching Activity (SGTA) classes from week 2 to week 13.

Participation in these activities will gain no marks, but is a requirement to pass the unit. Active participation is assessed by an iLearn quiz and instructors' observations of students' work during classes.

On successful completion you will be able to:

- Demonstrate foundational learning skills including active engagement in their learning process.

### 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.

It is your responsibility to find an appropriate location with a reliable internet connection where you can complete the exam. It is advisable to plan this in advance.

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 Test

Due: **Week 7 SGTA class**

Weighting: **20%**

In your Week 7 Small Group Teaching Activity (SGTA) class you will sit a test. The test will be conducted under exam conditions, that is, silently and with no communication between students. The duration of the test will be 40 mins.

You may bring in a single page of A4 handwritten notes. The test will cover material from calendar weeks 1-5 of lectures.

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 12**

Weighting: **20%**

The Assignment will be due in Week 12. The assignment will cover all learning outcomes and focus mainly on the material covered in lectures from Weeks 6-9 (SGTA classes held in weeks 7-10).

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.

## Final Exam

Due: **Formal 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).

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 (29 Jul)	Course introduction; One-sided tests; Type I and Type II error; Introduction to R/RStudio	
2 (5 Aug)	Modified two-sample t-test; Assessing normality and equal variance assumptions	
3 (12 Aug)	One-way ANOVA	
4 (19 Aug)	One-way ANOVA and multiple comparisons	iLearn quiz
5 (26 Aug)	Transformations; Non-parametric tests; Power; Sample Size	
6 (2 Sep)	Data management; R Markdown; Simple linear regression	
7 (9 Sep)	Simple linear regression and model validation; Multiple regression	Mid Semester Exam
	<i>Mid-Semester Break</i>	
8 (30 Sep)	Multiple regression and model validation	
10* (14 Oct)	Extensions and examples of multiple regression	
11 (21 Oct)	Two-way ANOVA	
12 (28 Oct)	Two-way ANOVA and multiple comparisons	Assignment
13 (3 Jun)	Two-Way ANOVA and multiple regression connection	

\*Labour Day occurs on 8 Oct: Hence there is no lecture for week 9 of the semester. Hence, week 9 content will resume in week 10.

## Policies and Procedures

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

## 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 outcome

- Demonstrate foundational learning skills including active engagement in their learning process.

### Assessment task

- SGTA Participation

## 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.

### Assessment tasks

- iLearn Quiz
- Mid-Semester Test
- 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.

### Assessment tasks

- iLearn Quiz
- Mid-Semester Test
- 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.

## **Assessment tasks**

- iLearn Quiz
- Mid-Semester Test
- Assignment
- Final Exam

## **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 outcome**

- Demonstrate foundational learning skills including active engagement in their learning process.

## **Assessment task**

- SGTA Participation

## **Changes from Previous Offering**

Reduction of lectures from 3 to 2 hours per week.