



# STAT2114

## Design of Surveys and Experiments

Session 2, Special circumstances 2021

*Department of Mathematics and Statistics*

### Contents

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<a href="#"><u>General Information</u></a>	2
<a href="#"><u>Learning Outcomes</u></a>	2
<a href="#"><u>General Assessment Information</u></a>	3
<a href="#"><u>Assessment Tasks</u></a>	4
<a href="#"><u>Delivery and Resources</u></a>	7
<a href="#"><u>Unit Schedule</u></a>	8
<a href="#"><u>Policies and Procedures</u></a>	8
<a href="#"><u>Changes from Previous Offering</u></a>	10

#### **Disclaimer**

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#### **Session 2 Learning and Teaching Update**

The decision has been made to conduct study online for the remainder of Session 2 for all units WITHOUT mandatory on-campus learning activities. Exams for Session 2 will also be online where possible to do so.

This is due to the extension of the lockdown orders and to provide certainty around arrangements for the remainder of Session 2. We hope to return to campus beyond Session 2 as soon as it is safe and appropriate to do so.

Some classes/teaching activities cannot be moved online and must be taught on campus. You should already know if you are in one of these classes/teaching activities and your unit convenor will provide you with more information via iLearn. If you want to confirm, see the list of [units with mandatory on-campus classes/teaching activities](#).

Visit the [MQ COVID-19 information page](#) for more detail.

## General Information

Unit convenor and teaching staff

Convener / Lecturer

Hassan Doosti

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12WW 534

TBA

Credit points

10

Prerequisites

STAT170 or STAT1170 or STAT150 or STAT1250 or STAT171 or STAT1371

Corequisites

STAT2170 or STAT2371 or BIOL2610 or PSYU2248

Co-badged status

STAT6114

Unit description

This unit introduces the fundamental principles of design of surveys and experiments. Survey design covers the following topics: quota sampling; question construction; common ambiguities and unintended biases; probability sampling; simple random sampling; stratified sampling; ratio and regression estimators; systematic sampling; and cluster sampling.

Experimental design covers the following topics: the completely randomised design; randomised blocks; random effects models; and analysis of covariance.

## Important Academic Dates

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

## Learning Outcomes

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

**ULO1:** Apply commonly used survey designs, sampling methods and appropriate statistical technique(s) to estimate population parameters based on a sample from each design.

**ULO2:** Identify potential issues in survey designs, such as sampling bias and non-

sampling errors.

**ULO3:** Apply basic knowledge to design questionnaires and construct questions.

**ULO4:** Identify suitable experimental designs to solve a variety of problems.

**ULO5:** Identify appropriate statistical method(s) and use relevant software for the analysis of data from a variety of experimental designs.

**ULO6:** Evaluate the ethical relevance and implications in the design of a questionnaire and in the formulation of its questions.

## General Assessment Information

**HURDLES:** No hurdle requirements

**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 assessment tasks must be submitted by the official due date and time. In the case of a late submission for a non-timed assessment (e.g. an assignment), if special consideration has NOT been granted, 20% of the earned mark will be deducted for each 24-hour period (or part thereof) that the submission is late for the first 2 days (including weekends and/or public holidays). For example, if an assignment is submitted 25 hours late, its mark will attract a penalty equal to 40% of the earned mark. After 2 days (including weekends and public holidays) a mark of 0% will be awarded. Timed assessment tasks (e.g. tests,

examinations) do not fall under these rules.

**FINAL EXAM POLICY:** 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 in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during this 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.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Assignment 1</a>	15%	No	Week 4
<a href="#">Online Mid-Semester Test</a>	15%	No	Week 7
<a href="#">Assignment 2</a>	15%	No	Week 12
<a href="#">Final Exam</a>	55%	No	University Examination Period

### Assignment 1

Assessment Type <sup>1</sup>: Quantitative analysis task

Indicative Time on Task <sup>2</sup>: 14 hours

Due: **Week 4**

Weighting: **15%**

An assignment is set for students to complete independently, applying the knowledge gained from lectures, SGTA exercises, and their readings, and using statistical software. They will be made available on iLearn.

On successful completion you will be able to:

- Apply commonly used survey designs, sampling methods and appropriate statistical

technique(s) to estimate population parameters based on a sample from each design.

- Identify potential issues in survey designs, such as sampling bias and non-sampling errors.
- Apply basic knowledge to design questionnaires and construct questions.
- Evaluate the ethical relevance and implications in the design of a questionnaire and in the formulation of its questions.

## Online Mid-Semester Test

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 14 hours

Due: **Week 7**

Weighting: **15%**

A test will be made available on iLearn.

On successful completion you will be able to:

- Apply commonly used survey designs, sampling methods and appropriate statistical technique(s) to estimate population parameters based on a sample from each design.
- Apply basic knowledge to design questionnaires and construct questions.
- Identify appropriate statistical method(s) and use relevant software for the analysis of data from a variety of experimental designs.
- Evaluate the ethical relevance and implications in the design of a questionnaire and in the formulation of its questions.

## Assignment 2

Assessment Type <sup>1</sup>: Quantitative analysis task

Indicative Time on Task <sup>2</sup>: 14 hours

Due: **Week 12**

Weighting: **15%**

An assignment is set for students to complete independently, applying the knowledge gained from lectures, SGTA exercises, and their readings, with or without using statistical software.

They will be made available on iLearn.

On successful completion you will be able to:

- Identify potential issues in survey designs, such as sampling bias and non-sampling errors.
- Identify suitable experimental designs to solve a variety of problems.
- Identify appropriate statistical method(s) and use relevant software for the analysis of data from a variety of experimental designs.

## Final Exam

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 34 hours

Due: **University Examination Period**

Weighting: **55%**

An examination held during the University's formal examination period.

On successful completion you will be able to:

- Apply commonly used survey designs, sampling methods and appropriate statistical technique(s) to estimate population parameters based on a sample from each design.
- Identify potential issues in survey designs, such as sampling bias and non-sampling errors.
- Apply basic knowledge to design questionnaires and construct questions.
- Identify suitable experimental designs to solve a variety of problems.
- Identify appropriate statistical method(s) and use relevant software for the analysis of data from a variety of experimental designs.
- Evaluate the ethical relevance and implications in the design of a questionnaire and in the formulation of its questions.

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<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Learning Skills Unit](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

### Classes

The unit is delivered by lectures (2 hours per week, starting in Week 1) and SGTAs (1 hour per week, starting in Week 2). All teaching material will be available on iLearn.

SGTA exercises will be available from iLearn prior to the SGTA. Students are expected to have attempted these prior to the SGTA. Solutions will be explained, with emphasis on any area students had trouble with. At the end of the week, these solutions will then be placed on iLearn. The web address is <https://ilearn.mq.edu.au>.

### Course materials, recommended text and other references

Lecture notes will be made available on the unit iLearn page (<https://ilearn.mq.edu.au/>).

#### **Recommended text:**

- Lohr, Sharon L (2019). Sampling: Design and Analysis, Second Edition, Boca Raton, FL : CRC Press, *for Survey Design*.
- Lawson, J. (2014). Design and Analysis of Experiments with R. Chapman and Hall/ CRC, *for Experiment Design*;

These are available from the Co-Op Bookshop and the University library.

#### **Other useful references** (available in library Reserve):

Kuehl, R.O. (2000 or newer). Statistical Principles of Research Design and Analysis, Second edition, Duxbury Press.

Lindman HR (1992). Analysis of Variance in Experimental Design.

Montgomery DC. (2019). Design and Analysis of Experiments, 10th Edition, Wiley.

Neter J, Wasserman W and Kutner M. (2004). Applied Linear Statistical Models.

Scheaffer RL, Mendenhall W and Ott RL (1996). Elementary Survey Sampling, 5th (or newer) Edition.

Cochran WG (1977). Sampling Techniques.

Moser CA & Kalton G (1971). Survey Methods in Social Investigations.

Barnett V (1974). Elements of Sampling Theory.

### Technology Used and Required

**Software:** We are using R through Rstudio in teaching this unit. R and Rstudio are free software and are widely used nowadays by statisticians. Students need to practice how to use the software and be expected to use R for the assignment. Students should also note that the test and the final examination may contain inline R codes and output that students need to interpret to answer the questions.

## Unit Schedule

### Survey design:

Week	Topic
1	Introduction to surveys: sample survey and its principal steps, probability and non-probability sampling, and sources of error
2	Simple random sampling (SRS); Parameter estimation
3	SRS (contd): estimation of proportion; Stratified random sampling
4	Stratified random sampling (contd); Choosing strata sample sizes
5	Ratio and regression estimators
6	Cluster sampling; Systematic sampling

### Experimental design:

Week	Topic
7	Designed experiments vs observational studies; Completely randomized design (CRD): one-way ANOVA
8	One-way ANOVA (contd); Contrasts
9	Contrasts (contd); Multiple comparisons; Model checking
10	More on CRD; Randomized block design (RBD)
11	Factorial experiments: two-way ANOVA; Random effects – one-way
12	Analysis of covariance

Week 13: Revision (self study and exam preparation)

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). 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](#)

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

To find other policies relating to Teaching and Learning, visit [Policy Central](https://policies.mq.edu.au) (<https://policies.mq.edu.au>) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/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 help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Enquiry Service

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

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

## Equity 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.

## 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.

## Changes from Previous Offering

R is used in this offering instead of Minitab.