



# STAT2114

## Design of Surveys and Experiments

Session 2, In person-scheduled-weekday, North Ryde 2024

*School of Mathematical and Physical Sciences*

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## General Information

Unit convenor and teaching staff

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Lecturer/Convener

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Please refer to iLearn for Consultation hours.

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

This unit is co-badged STAT6114.

Unit description

This unit provides an introduction to survey design and experimental design. In survey design we look at different sampling strategies and analysis of population estimates. In experimental design we learn how to construct basic designs as well as the statistical methods available for analysis. Real life applications are used.

## 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:

**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 basic 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:

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the

total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7<sup>th</sup> day (including weekends). After the 7<sup>th</sup> day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is **11:55 pm**. A 1-hour grace period will be provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for [Special Consideration](#).

### **Assessments where Late Submissions will be accepted**

In this unit, late submissions will be accepted as follows:

- Assignments 1 and 2 – YES, Standard Late Penalty applies
- Online Mid-Semester Test- NO, unless Special Consideration is Granted

### **SPECIAL CONSIDERATION:**

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the written assessments in this unit on time, please inform the convenor and submit a Special Consideration request through [ask.mq.edu.au](http://ask.mq.edu.au).

**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	Formal 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 basic 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 basic experimental designs.

## Final Exam

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

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

Due: **Formal 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 basic 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 [Writing Centre](#) 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 \(2022\). Sampling: Design and Analysis, Third Edition, Boca Raton, FL : CRC Press, for Survey Design.](#)

- [Lawson, J. \(2015\). 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)
	<b>Session 2 Break</b>
9	Contrasts (contd); Multiple comparisons;
10	Model checking
11	More on CRD; Randomized block design (RBD)
12	The 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](#)
- [Assessment Procedure](#)
- [Complaints Resolution 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 [connect.mq.edu.au](https://connect.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

## Student Support

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

## The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the 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 Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual

assault

- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

## Student Enquiries

Got a question? Ask us via the [Service Connect Portal](#), or contact [Service Connect](#).

## 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

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link in the iLearn page. Student feedback from the previous offering of this unit was very positive overall, with students pleased with the clarity around assessment requirements and the level of support from teaching staff. As such, no change to the delivery of the unit is planned, however we will continue to strive to improve the level of support and the level of student engagement.

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Unit information based on version 2024.01R of the [Handbook](#)