STAT6114

Design of Surveys and Experiments

Session 2, Online with attendance for exam, Exam centre within Australia 2021

Archive (Pre-2022) - Department of Mathematics and Statistics

Contents

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
STAT6170 or STAT670

Corequisites
STAT6180 or STAT680

Co-badged status
STAT2114

Unit description
*This unit has an online offering for S2 which is **synchronous**, meaning there will be set times to attend online lectures and tutorials.*

This unit introduces the fundamental principles of design of surveys and experiments. Survey design includes 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. Experiment 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://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 for survey design, 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.

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) 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
Assignment 1	15%	No	Week 4
Mid-Semester Test	15%	No	Week 7
Assignment 2	15%	No	Week 12
Final Exam	55%	No	University Examination Period

Assignment 1

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 12 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.
- 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.

Mid-Semester Test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 12 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.
- Identify potential issues for survey design, such as sampling bias and non-sampling errors.
- Apply basic knowledge to design questionnaires and construct questions.

Assignment 2

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 12 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 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 [1]: Examination
Indicative Time on Task [2]: 30 hours
Due: **University Examination Period**
Weighting: **55%**

There will be a two-hour written examination (plus ten minutes reading time) during the official University 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 for survey design, 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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[1] 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.

[2] 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). 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). 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) 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 or if you are a Global MBA student contact 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) 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 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

If you are a Global MBA student contact 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/.

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.