



STAT373

Design of Surveys and Experiments

S1 Day 2019

Dept of Mathematics and Statistics

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Disclaimer

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General Information

Unit convenor and teaching staff

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Credit points

3

Prerequisites

6cp at 200 level including (STAT270 or STAT271 or BIOL235(P) or PSY222 or PSY248(P))

Corequisites

Co-badged status

STAT814/STAT714

Unit description

This unit deals with the gathering and analysis of data. Students are given the foundations of survey design with some discussion of 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. The other component of the unit is a discussion of designed experiments and 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:

- understand commonly used experimental designs and be able to apply appropriate statistical method(s) for the analysis of data arising from each design
- understand basic survey sampling, be familiar with concepts such as sampling bias, sampling and non-sampling errors, and know the basics of questionnaire design and question construction

understand commonly used survey designs and sampling methods, and be able to use appropriate statistical technique(s) to estimate population parameters based on a sample from each design

have generally improved problem solving ability

have improved the ability to use computing software (Minitab) in solving practical problems

General Assessment Information

LATE SUBMISSION OF ASSESSMENT TASKS (SGTA work and Assignments):

All assessment tasks must be submitted by its due date and time.

No marks will be given for late submission or work unless an extension has been granted following a successful application for Special Consideration via ask.mq.edu.au. Please contact the unit convenor for advice as soon as you become aware that you may have difficulty meeting any of the assessment (eg, assignment) deadlines.

Final 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
SGTA work	10%	No	Weeks 2-13
Assignments	30%	No	Tuesday (Week 6, 9 & 12)
Examination	60%	No	University Examination Period

SGTA work

Due: **Weeks 2-13**

Weighting: **10%**

Each week a set of Small Group Teaching Activity (SGTA) exercises is made available on iLearn for students to practice. Each SGTA should be completed before participating in a 1-hour SGTA class per week from Week 2 to Week 13. Students are required to have their solutions to these STGAs checked and recorded by the STGA Instructor during classes for 10 (1% each) of the 12 weekly STGA exercises.

For late submission, please refer to the information under General Assessment Information section in this unit guide.

On successful completion you will be able to:

- understand commonly used experimental designs and be able to apply appropriate statistical method(s) for the analysis of data arising from each design
- understand basic survey sampling, be familiar with concepts such as sampling bias, sampling and non-sampling errors, and know the basics of questionnaire design and question construction
- understand commonly used survey designs and sampling methods, and be able to use appropriate statistical technique(s) to estimate population parameters based on a sample from each design

Assignments

Due: **Tuesday (Week 6, 9 & 12)**

Weighting: **30%**

Three assignments (10% each) are set for students to complete independently, applying the knowledge gained from lectures, SGTA exercises and their own reading, with and/or without using the statistical software, Minitab. They will be made available on iLearn.

Each of the three assignments are required to be submitted on the unit iLearn by its due date and time, which will be included in the assignment.

For late submission, please refer to the information under General Assessment Information section in this unit guide.

On successful completion you will be able to:

- understand commonly used experimental designs and be able to apply appropriate statistical method(s) for the analysis of data arising from each design
- understand basic survey sampling, be familiar with concepts such as sampling bias, sampling and non-sampling errors, and know the basics of questionnaire design and question construction
- understand commonly used survey designs and sampling methods, and be able to use appropriate statistical technique(s) to estimate population parameters based on a sample from each design
- have generally improved problem solving ability
- have improved the ability to use computing software (Minitab) in solving practical problems

Examination

Due: **University Examination Period**

Weighting: **60%**

There will be a two-hour written examination during the official University Examination period. The University Examination Timetable will be available in draft form approximately eight weeks before the commencement of the the University examinations and in final form approximately four weeks before the commencement of the examinations at: http://students.mq.edu.au/student_admin/exams/

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 apply for the 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.

On successful completion you will be able to:

- understand commonly used experimental designs and be able to apply appropriate statistical method(s) for the analysis of data arising from each design
- understand basic survey sampling, be familiar with concepts such as sampling bias, sampling and non-sampling errors, and know the basics of questionnaire design and question construction
- understand commonly used survey designs and sampling methods, and be able to use appropriate statistical technique(s) to estimate population parameters based on a sample from each design
- have generally improved problem solving ability

Delivery and Resources

Classes

Students are required to attend one 3-hour lecture per week **beginning in Week 1**, and one 1-hour SGTA class in computer laboratory **beginning in Week 2**.

Times and locations for all classes can be found on the University web site at: www.timetables.mq.edu.au. In the case of changing classes, time and/or location, you will be informed at the lecture and/or on the unit iLearn in advance.

Note: You are welcome to come to see the lecturer during staff consultation time with questions related to the unit. You could also contact the lecturer by e-mail or telephone. Only the **Macquarie University student e-mail accounts** may be used to communicate with staff.

Course materials, recommended text and other references

Weekly lecture notes will be made available on the unit iLearn (<https://iLearn.mq.edu.au/>) at least one day before the lecture. Students should print out and bring the relevant lecture notes into the lecture.

Recommended text

Kuehl, R.O. (2000 or newer). *Statistical Principles of Research Design and Analysis*, Second edition, Duxbury Press, *for Experiment Design*; Lohr, S.L. (2010). *Sampling: Design and Analysis*, Duxbury Press, *for Survey Design*. These are available from the Co-Op Bookshop and the University library.

Other useful references (available in library Reserve):

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

Montgomery DC. *Design and Analysis of Experiments*, 5th or 4th Edition.

Neter J, Wasserman W and Kutner M. *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: Minitab is used in this unit. Information about Minitab can be found on its web site at <http://www.minitab.com>. This software is provided for free to Macquarie students, and can be downloaded from the student portal at <http://students.mq.edu.au/home/> for home use. Students can also use Minitab online via iLab (<https://wiki.mq.edu.au/display/iLab/About>). **Remember that any work or results produced via iLab in all computing labs on the University campus must be saved onto iLab desktop and then emailed to yourself.**

Calculator: An electronic calculator is required throughout this unit. Only calculators with no text retrieval capacity are permitted to be used in the examination.

Unit Web Page and iLearn access: The unit web page is available on iLearn under the 'STAT373 Design of Surveys and Experiments/STAT814_STAT714 Statistical Design' link. Enrolment in STAT373 should automatically make this iLearn site available to you from the start of semester. To access it, log in at <https://iLearn.mq.edu.au/login/MQ/> and select STAT373 from your list of iLearn units. If STAT373 doesn't appear, although you enrolled in the unit more than 24 hours ago, please contact the Unit Convenor immediately. Note that you should visit this web site regularly for course materials including lecture slides, lecture recordings, tutorials and assignments, and also possible announcements placed by the Lecturer.

The **Discussion Forum** on the unit iLearn can be used for online discussion with other students

enrolled in STAT373 (also STAT814 and STAT714 if any) on any problems or topics related to the unit. The lecturer will visit the Forum from time to time.

Learning and Teaching activities

Lectures: Lectures begin in Week 1. Students are required to attend a 3-hour lecture each week. Topic(s) for each week are set in the Unit Schedule in this unit guide. Students are encouraged to read the relevant chapter(s) recommended before coming to the lecture.

An iLecture will be recorded for each lecture **when possible** and made available on the unit iLearn (under ECHO360) soon after the lecture is completed.

SGTA and SGTA exercises: Students are required to attend one 1-hour SGTA per week from Week 2. A set of SGTA exercises will be made available each week for students to practice. Students should complete the relevant exercises before coming to their class where their work is checked by the instructor and the solution to the exercises is discussed. The solutions will be also made available on iLearn soon after the class.

Assignments: Three assignments are set in this unit for students to complete independently. To assist with further learning, solutions to the assignments will be made available later on iLearn.

Unit Schedule

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Experimental design:

Week	Topic	Chapter (Kuehl)
1	Designed experiments vs observational studies; Completely randomized design (CRD); one-way ANOVA	1, 2
2	One-way ANOVA (contd); Contrasts	2, 3
3	Contrasts (contd) and multiple comparisons; Model checking	3, 4
4	More on CRD; Randomized block design (RBD)	4, 8
5	Factorial experiments: two-way ANOVA; Random effects – one-way	6, 5, 11
6	Analysis of covariance	7, 17, 11

Survey design:

Week	Topic	Chapter (Lohr)
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7	Introduction to surveys: sample survey and its principal steps, probability and non-probability sampling, sources of error and simple random sampling	1
8	Simple random sampling (SRS): infinite population, finite population and parameter estimation	2
9	SRS (contd): estimation of proportion; Stratified random sampling	2, 4
10	Stratified random sampling (contd); Choosing strata sample sizes	4, 3
11	Ratio and regression estimators	3
12	Cluster sampling; Systematic sampling	5
13	Revision (Self study and exam preparation)	

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 \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

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](#) 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 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](#)

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.

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:

Assessment task

- Assignments

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

- understand commonly used experimental designs and be able to apply appropriate statistical method(s) for the analysis of data arising from each design
- understand basic survey sampling, be familiar with concepts such as sampling bias, sampling and non-sampling errors, and know the basics of questionnaire design and question construction
- understand commonly used survey designs and sampling methods, and be able to use appropriate statistical technique(s) to estimate population parameters based on a sample from each design
- have improved the ability to use computing software (Minitab) in solving practical problems

Assessment tasks

- Assignments
- Examination

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

- understand commonly used experimental designs and be able to apply appropriate statistical method(s) for the analysis of data arising from each design
- understand commonly used survey designs and sampling methods, and be able to use appropriate statistical technique(s) to estimate population parameters based on a sample from each design

Assessment tasks

- Assignments
- Examination

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

- have generally improved problem solving ability
- have improved the ability to use computing software (Minitab) in solving practical problems

Assessment tasks

- Assignments
- Examination

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:

Assessment tasks

- SGTA work
- Assignments

Changes from Previous Offering

No major differences from previous offering.