



UNSW Course Outline

MATH3851 Experimental Design and Categorical Data - 2024

Published on the 03 Sep 2024

General Course Information

Course Code : MATH3851

Year : 2024

Term : Term 3

Teaching Period : T3

Is a multi-term course? : No

Faculty : Faculty of Science

Academic Unit : School of Mathematics & Statistics

Delivery Mode : In Person

Delivery Format : Standard

Delivery Location : Kensington

Campus : Sydney

Study Level : Undergraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

This is a course in statistics that focuses on the principles of good experimental design and the statistical tools appropriate for discrete valued data. The course is an optional component of a statistics major. Students will learn about the importance experimental design, Analysis of

Variance (ANOVA), multiple comparison techniques, randomised complete block designs, Latin square designs, two-way interaction models, factorial designs and their analysis, random effects models, analysis of cross-tabulated data, logistic and Poisson regression for analysis of binary and count data and log-linear models for contingency tables. Students will use the statistical package R/RStudio throughout the course. Lecture content will be delivered in-person and will be recorded and made available online. Tutorials will be face to face.

Course Aims

The course is divided into two parts: Experimental Design and Categorical Data Analysis. In Experimental Design students will learn about the importance of experimental design and about principles that allow them to extract maximum amount of information for a given sample size from available sources. In Categorical Data Analysis students will learn about statistical tools and techniques that are specifically tailored towards analysing discrete valued data such as counts, frequencies, survey data. Students will be able to answer questions about presence or absence of association between categorical variables using cross-tabulated data. They will also learn how to model the association between the categorical variables by using techniques such as Logistic, Poisson regression and Log-linear models. In both parts, students will develop an understanding of the methodology and will be able to apply it to practical analysis of real datasets in tutorial classes.

Relationship to Other Courses

Prerequisite: MATH2801 OR MATH2901 AND MATH2831 OR MATH2931.

Course Learning Outcomes

Course Learning Outcomes
CL01 : Use the terminology, notation and concepts in the theory, methods and application of statistical design and analysis of experiments.
CL02 : Obtain estimates of the precision of estimates in design problems.
CL03 : Formulate and solve design problems, to analyse the adequacy of a particular model in each problem.
CL04 : Describe the characteristics of different types of categorical data.
CL05 : Select and apply the appropriate probability models for analysing categorical data.
CL06 : Apply the models to the analysis of datasets using statistical software packages, interpret the results and draw conclusions.
CL07 : Use R/RStudio for statistical application related to experimental design or categorical data analysis.

Course Learning Outcomes	Assessment Item
CLO1 : Use the terminology, notation and concepts in the theory, methods and application of statistical design and analysis of experiments.	<ul style="list-style-type: none"> • Assignment 1 • Mid-Term Test • Assignment 2 • Final Exam
CLO2 : Obtain estimates of the precision of estimates in design problems.	<ul style="list-style-type: none"> • Assignment 1 • Mid-Term Test • Assignment 2 • Final Exam
CLO3 : Formulate and solve design problems, to analyse the adequacy of a particular model in each problem.	<ul style="list-style-type: none"> • Assignment 1 • Final Exam
CLO4 : Describe the characteristics of different types of categorical data.	<ul style="list-style-type: none"> • Assignment 2 • Final Exam
CLO5 : Select and apply the appropriate probability models for analysing categorical data.	<ul style="list-style-type: none"> • Assignment 2 • Final Exam
CLO6 : Apply the models to the analysis of datasets using statistical software packages, interpret the results and draw conclusions.	<ul style="list-style-type: none"> • Assignment 1 • Assignment 2
CLO7 : Use R/RStudio for statistical application related to experimental design or categorical data analysis.	<ul style="list-style-type: none"> • Assignment 1 • Assignment 2

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

New ideas and skills are introduced and demonstrated in lectures, then students develop these skills by applying them to specific tasks in tutorials and assessments.

We believe that effective learning is best supported by a climate of inquiry, in which students are actively engaged in the learning process. This course has a strong emphasis on problem-solving tasks in tutorials and in assessments. Students are expected to devote the majority of class and study time to the solving of such tasks.

Additional Course Information

Please see Moodle announcement for any updates or changes.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Assignment 1 Assessment Format: Individual	10%	Start Date: Not Applicable Due Date: Week 4
Mid-Term Test Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Week 7
Assignment 2 Assessment Format: Individual	10%	Start Date: Not Applicable Due Date: Week 10
Final Exam Assessment Format: Individual	60%	Start Date: Not Applicable Due Date: Exam Period

Assessment Details

Assignment 1

Assessment Overview

In Week 4 you will submit an assignment which will cover material from Weeks 1 to 3. It will be made available a few weeks before the submission date.

The rationale for the assignment is to give you feedback on your progress and mastery of the material, and to obtain measures of your progress towards the stated learning outcomes.

Assignments will give you an opportunity to try your hand at more difficult problems requiring more than one line of argument and introduce you to aspects of the subject which are not explicitly covered in lectures.

You will be expected to use the use R/RStudio to perform statistical computations and simulations.

Feedback will be given when the marks are released within ten working days after the due date.

Course Learning Outcomes

- CL01 : Use the terminology, notation and concepts in the theory, methods and application of statistical design and analysis of experiments.
- CL02 : Obtain estimates of the precision of estimates in design problems.
- CL03 : Formulate and solve design problems, to analyse the adequacy of a particular model in each problem.
- CL06 : Apply the models to the analysis of datasets using statistical software packages, interpret the results and draw conclusions.
- CL07 : Use R/RStudio for statistical application related to experimental design or categorical

data analysis.

Detailed Assessment Description

See the MATH3851 Moodle course page for further details.

Assessment Length

No more than 10 pages.

Submission notes

Submit via Turnitin in Moodle

Assessment information

Standard late submission penalties apply.

See the MATH3851 Moodle course page for further details.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Generative AI Permission Level

Simple Editing Assistance

In completing this assessment, you are permitted to use standard editing and referencing functions in the software you use to complete your assessment. These functions are described below. You must not use any functions that generate or paraphrase passages of text or other media, whether based on your own work or not.

If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see [here](#).

Mid-Term Test

Assessment Overview

In Week 7 you will complete a paper based test.

The midterm test will usually have a one-hour time limit. You only have one attempt at the midterm test. Questions typically include material from Weeks 1 to 5 covered in lectures and

tutorials. Both short answer questions and some longer questions requiring clear and logical presentation of correct solutions will be given. More information about what will be assessed will be made available closer to the time in lectures.

The midterm test is held under exam conditions. It is designed to give you feedback on progress and mastery of the first parts of the course, under exam conditions and to evaluate progress towards the stated learning outcomes.

Feedback will be given when the marks are released within ten working days after the due date.

Course Learning Outcomes

- CL01 : Use the terminology, notation and concepts in the theory, methods and application of statistical design and analysis of experiments.
- CL02 : Obtain estimates of the precision of estimates in design problems.

Detailed Assessment Description

See the MATH3851 Moodle course page for further details.

Assessment Length

60 mins

Submission notes

Written pen-and-paper style test

Assessment information

See the MATH3851 Moodle course page for further details.

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see [here](#).

Assignment 2

Assessment Overview

In Week 10 you will submit an assignment which will cover material from Weeks 8 to 9. It will be made available a few weeks before the submission date.

The rationale for the assignment is to give you feedback on your progress and mastery of the material, and to obtain measures of your progress towards the stated learning outcomes.

Assignments will give you an opportunity to try your hand at more difficult problems requiring more than one line of argument and introduce you to aspects of the subject which are not explicitly covered in lectures.

You will be expected to use the use R/RStudio to perform statistical computations and simulations.

Feedback will be given when the marks are released within ten working days after the due date.

Course Learning Outcomes

- CL01 : Use the terminology, notation and concepts in the theory, methods and application of statistical design and analysis of experiments.
- CL02 : Obtain estimates of the precision of estimates in design problems.
- CL04 : Describe the characteristics of different types of categorical data.
- CL05 : Select and apply the appropriate probability models for analysing categorical data.
- CL06 : Apply the models to the analysis of datasets using statistical software packages, interpret the results and draw conclusions.
- CL07 : Use R/RStudio for statistical application related to experimental design or categorical data analysis.

Detailed Assessment Description

See the MATH3851 Moodle course page for further details.

Assessment Length

At most 5 pages

Submission notes

Submitted via Turnitin in Moodle

Assessment information

See the MATH3851 Moodle course page for further details.

Standard late submission penalties apply.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Generative AI Permission Level

Simple Editing Assistance

In completing this assessment, you are permitted to use standard editing and referencing functions in the software you use to complete your assessment. These functions are described below. You must not use any functions that generate or paraphrase passages of text or other media, whether based on your own work or not.

If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see [here](#).

Final Exam

Assessment Overview

The final exam is designed to summarise you're learning and problem-solving skills on all topics delivered across all weeks of the term, including material from lectures and tutorials. The exam is typically 2hrs 10 minutes and consists of short numerical and short answer responses - details will be confirmed during the course. The examination will occur during the official university examination period. Feedback is available through inquiry with the course convenor.

Course Learning Outcomes

- CL01 : Use the terminology, notation and concepts in the theory, methods and application of statistical design and analysis of experiments.
- CL02 : Obtain estimates of the precision of estimates in design problems.
- CL03 : Formulate and solve design problems, to analyse the adequacy of a particular model in each problem.
- CL04 : Describe the characteristics of different types of categorical data.
- CL05 : Select and apply the appropriate probability models for analysing categorical data.

Detailed Assessment Description

See the MATH3851 Moodle course page for further details.

Assessment Length

2 hours

Assessment information

See the MATH3851 Moodle course page for further details.

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see [here](#).

General Assessment Information

See Moodle course page or contact the course convenor for further details.

Grading Basis

Standard

Requirements to pass course

Final mark ≥ 50

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 0 : 2 September - 8 September	Other	
Week 1 : 9 September - 15 September	Lecture	Chapter 1: Basic Concepts and Principals of Experimental Design
Week 2 : 16 September - 22 September	Lecture	Chapter 2: Completely Randomised Designs (CRD) (One-way Analysis of Variance, ANOVA), Nonparametric ANOVA and Homogeneity of Variance Test
Week 3 : 23 September - 29 September	Lecture	Chapter 3: Multiple Comparison Techniques, and Estimating and Testing Contrasts
Week 4 : 30 September - 6 October	Assessment	Assignment 1 is due
	Lecture	Chapter 4: ANOVA for Randomised Complete Block Designs (RCBD) and Latin Square Designs
Week 5 : 7 October - 13 October	Lecture	Chapter 5: Factorial Designs: Two-way Factorial Experiments and Dealing with Interactions
Week 6 : 14 October - 20 October	Other	Flexibility week
Week 7 : 21 October - 27 October	Assessment	The mid-term test will be help in Week 7
	Lecture	Chapter 5: Analysis of 2k Factorial Experiments Chapter 6: Designs with Random Effects
Week 8 : 28 October - 3 November	Lecture	Chapter 7: Introduction to Categorical Data and Two-way Contingency Tables
Week 9 : 4 November - 10 November	Lecture	Chapter 8: Stratified 2 by 2 Tables, 2 by K Tables, I by J Tables and Three-Way Tables Chapter 9: Log-Linear Models for Contingency Tables
Week 10 : 11 November - 17 November	Assessment	Assignment 2 is due
	Lecture	Chapter 9: Logistic Regression Models

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

Each week we will have **two** (2 hours) in-person lectures and one (1 hour) in-person tutorial (total: 5 hours).

See the MATH3851 Moodle page to obtain the lecture notes. I will add a new chapter each week.

Course Resources

Prescribed Resources

The content of the course will be defined by the lectures.

Recommended Resources

The following are recommended additional references:

Montgomery, D., *Design and Analysis of Experiments*, Wiley, 9th edition, 2019. (Recommended

textbook for Part I).

Kirk, R., *Experimental Design: Procedures for the Behavioral Sciences*, Brooks/Cole Publishing, 3rd edition, 1995.

Le, C. T., *Applied Categorical Data Analysis*, Wiley, 1998. (Recommended textbook for Part II).

Agresti, A., *An Introduction to Categorical Data Analysis*, Wiley, 1996.

Additional Costs

See UNSW The Nucleus: Student Hub if this applies to you

Course Evaluation and Development

Course evaluation will be conducted in MyExperience

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Head lecturer	Jakub Stoklosa		Anita Lawrence Building, East Wing (H13) - Room: 2082	Please use email above (or Tea	10 AM - 4 PM Monday to Thursday	No	Yes

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the [UNSW Student Code of Conduct Website](#).

Academic Honesty and Plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at <https://student.unsw.edu.au/referencing>

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The [Current Students site](#),
- The [ELISE training site](#), and
- The [Use of AI for assessments](#) site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>

Submission of Assessment Tasks

Penalty for Late Submissions

UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: <https://student.unsw.edu.au/special-consideration>

Important note: UNSW has a “fit to sit/submit” rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- [The Current Students Gateway](#)
- [Student Support](#)
- [Academic Skills and Support](#)
- [Student Wellbeing, Health and Safety](#)
- [Equitable Learning Services](#)
- [UNSW IT Service Centre](#)
- Science EDI Student [Initiatives](#), [Offerings](#) and [Guidelines](#)

School-specific Information

School of Mathematics and Statistics and UNSW Policies

The School of Mathematics and Statistics has adopted a number of policies relating to enrolment, attendance, assessment, plagiarism, cheating, special consideration etc. These are in addition to the Policies of The University of New South Wales. Individual courses may also adopt other policies in addition to or replacing some of the School ones. These will be clearly notified in the Course Initial Handout and on the Course Home Pages on the Maths Stats web site. Students

in courses run by the School of Mathematics and Statistics should be aware of the School and Course policies by reading the appropriate pages on the web site starting at: [The School of Mathematics and Statistics assessment policies](#)

The School of Mathematics and Statistics will assume that all its students have read and understood the School policies on the above pages and any individual course policies on the Course Initial Handout and Course Home Page. Lack of knowledge about a policy will not be an excuse for failing to follow the procedure in it.

Special Consideration - Short Extension Policy

The School of Mathematics and Statistics has carefully reviewed its range of assignments and projects to determine their suitability for automatic short extensions as set out by the UNSW Short Extension Policy. Upon comprehensive examination of our course offerings that incorporate these types of assessments, we have concluded that our current deadline structures already accommodate the possibility of unexpected circumstances that may lead students to require additional days for submission. Consequently, the School of Mathematics and Statistics has decided to universally opt out of the Short Extension provision for all its courses, having pre-emptively integrated flexibility into our assessment deadlines. The decision is subject to revision in response to the introduction of new course offerings. Students may still apply for Special Consideration via the usual procedures.

Computing Lab

The main computing laboratory is room G012 of the Anita B. Lawrence Centre (formerly Red Centre). You can get to this lab by entering the building through the main entrance to the School of Mathematics (on the Mezzanine Level) and then going down the stairs to the Ground Level. A second smaller lab is Room M020, located on the mezzanine level through the glass door (and along the corridor) opposite the School's entrance.

For more information, including opening hours, see the [computing facilities webpage](#). Remember that there will always be unscheduled periods when the computers are not working because of equipment problems and that this is not a valid excuse for not completing assessments on time.

School Contact Information

Please visit the [School of Mathematics and Statistics website](#) for a range of information.

For information on Courses, please go to "Student life & resources" and either Undergraduate and/or Postgraduate and respective "Undergraduate courses" and "Postgraduate courses" for information on all course offerings.

All school policies, forms and help for students can be located by going to the "Student Services" within "Student life & resources" page. We also post notices in "Student noticeboard" for your information. Please familiarise yourself with the information found in these locations. If you cannot find the answer to your queries on the web you are welcome to contact the Student Services Office directly.

Undergraduate

E: ug.mathsstats@unsw.edu.au

P: 9385 7011 or 9385 7053

Postgraduate

E: pg.mathsstats@unsw.edu.au

P: 9385 7053

Should we need to contact you, we will use your official UNSW email address of in the first instance. **It is your responsibility to regularly check your university email account. Please use your UNSW student email and state your student number in all emails to us.**