STAT2173

Introduction to Probability

Session 1, In person-scheduled-weekday, North Ryde 2025

School of Mathematical and Physical Sciences

Contents

General Information

Unit convenor and teaching staff
Lecturer
Connor Smith
connor.smith@mq.edu.au
Contact via email
12WW 617
See iLearn for consultation hours

Lecturer
Frank Valckenborgh
frank.valckenborgh@mq.edu.au
Contact via email
12WW 613
See iLearn for consultation hours

Frank Valckenborgh
frank.valckenborgh@mq.edu.au

Credit points
10

Prerequisites
(FOSE1015 or STAT1170 or STAT1371 or STAT1250) and ((HSC Mathematics Advanced Band 4 and above or Extension 1 Band E2 and above or Extension 2 Band E2 or above) or (10cp from FOSE1005 or MATH1000 or MATH1010-MATH1025))

Corequisites

Co-badged status
STAT6183

Unit description
This unit consolidates and expands upon the material on probability introduced in statistics units at 100 level. The emphasis is on the understanding of probability concepts and their application. Examples are taken from areas as diverse as biology, medicine, finance, sport, and the social and physical sciences. Topics include: the foundations of probability; probability models and their properties; some commonly used statistical distributions; relationships and association between variables; distribution of functions of random variables and sample statistics; approximations including the central limit theorem; and an introduction to the behaviour of random processes. Simulation is used to demonstrate many of these concepts.

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: Analyse probability and conditional probability of an event by applying a probabilistic model for an experiment.

ULO2: Apply a range of strategies to find and interpret the moments of discrete and continuous random variables including their expected values and variances.

ULO3: Apply the Law of Large Numbers (LLN) and the Central Limit Theorem (CLT) to find asymptotic distribution of a sample mean

ULO4: Analyse a bivariate probability distribution to find and interpret corresponding covariances, correlations, marginal and conditional probability distributions.

ULO5: Apply Markov Chain (MC) theory to practical problems and tasks.

General Assessment Information

To pass this unit you must achieve a total mark equal to or greater than 50%.

There are no hurdle assessments for this unit.

The tests and exam must be undertaken at the time indicated in the unit guide or on iLearn. Should these activities be missed due to illness or misadventure, students may apply for special consideration.

We strongly encourage all students to actively participate in all learning activities. Regular engagement is crucial for your success in this unit, as these activities provide opportunities to deepen your understanding of the material, collaborate with peers, and receive valuable feedback from instructors, to assist in completing the unit assessments. Your active participation not only enhances your own learning experience but also contributes to a vibrant and dynamic learning environment for everyone.

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. The assisgnment must be submitted by 11:55 pm on its due date. 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) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11:55 pm. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests and exams, students need to submit an application for Special Consideration.

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

- Test 1 - NO, unless Special Consideration is granted
- Test 2 - NO, unless Special Consideration is granted
- Assignment - YES, Standard Late Penalty applies
- Final Examination - 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 assessments in this unit on time, please inform the convenor and submit a Special Consideration request through https://connect.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 https://connect.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.

Assessment Tasks

Name	Weighting	Hurdle	Due
Test 1	15%	No	Week 4
Test 2	15%	No	Week 8
Assignment	20%	No	Week 12
Final Exam	50%	No	University Examination Period

Test 1

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 1 hours
Due: **Week 4**
Weighting: **15%**

50-minute test

On successful completion you will be able to:

- Analyse probability and conditional probability of an event by applying a probabilistic model for an experiment.
- Apply a range of strategies to find and interpret the moments of discrete and continuous random variables including their expected values and variances.

Test 2

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 1 hours
Due: **Week 8**
Weighting: **15%**

50-minute test

On successful completion you will be able to:

- Analyse probability and conditional probability of an event by applying a probabilistic model for an experiment.
- Apply a range of strategies to find and interpret the moments of discrete and continuous random variables including their expected values and variances.
- Apply the Law of Large Numbers (LLN) and the Central Limit Theorem (CLT) to find asymptotic distribution of a sample mean

Assignment

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 10 hours
Due: **Week 12**
Weighting: **20%**

Students will be given two weeks to complete the assignment.

On successful completion you will be able to:

- Analyse probability and conditional probability of an event by applying a probabilistic model for an experiment.
- Apply a range of strategies to find and interpret the moments of discrete and continuous random variables including their expected values and variances.
- Apply the Law of Large Numbers (LLN) and the Central Limit Theorem (CLT) to find asymptotic distribution of a sample mean
- Analyse a bivariate probability distribution to find and interpret corresponding covariances, correlations, marginal and conditional probability distributions.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 2 hours
Due: **University Examination Period**
Weighting: **50%**

Formal invigilated examination testing the learning outcomes of the unit.

On successful completion you will be able to:

- Analyse probability and conditional probability of an event by applying a probabilistic model for an experiment.
- Apply a range of strategies to find and interpret the moments of discrete and continuous random variables including their expected values and variances.
- Apply the Law of Large Numbers (LLN) and the Central Limit Theorem (CLT) to find asymptotic distribution of a sample mean
- Analyse a bivariate probability distribution to find and interpret corresponding covariances, correlations, marginal and conditional probability distributions.
- Apply Markov Chain (MC) theory to practical problems and tasks.

---

[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

Technologies used and required

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.

The R software (freely available online) will be used in the unit. 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.

Required and Recommended texts and/or materials

There is no required textbook for this unit. Students may benefit from having access to the following background reference for additional reading and problems:

- Wackerly, D. D., Mendenhall, W., Scheaffer, R. L. Mathematical Statistics with Applications (4th,5th, 6th or 7th Editions)

The following books may also be useful background references:

- Ross, S. A First Course in Probability, Pearson (5th, 6th, 7th, 9th or 9th Editions)
- Ward, M. D. and Gundlach, E. (2016) Introduction to Probability, W. H. Freeman and Company
- Kinney, J.J. (1997) Probability - An Introduction with Statistical Applications, John Wiley and Sons
- Scheaffer R.L. (1994) Introduction to Probability and Its Applications, (2nd Edition) Duxbury Press
- Sincich,T., Levine, D.M., Stephan, D. (1999) Practical Statistics by Example using Microsoft Excel

At least one copy of each of these is available in the Library, and extra copies may be available on the shelves for borrowing purposes.

It should be understood that there are variations in notation (and even in definition) from one reference book to another, and that the lecture material alone defines recommended notation. Note that all lecture notes will be available in pdf form on the Unit website on iLearn before the lecture.

Methods of Communication

We will communicate with you via your university email or through announcements on iLearn. Queries to the convenor can either be placed on the iLearn discussion board or sent to the staff email address from your university email address.

Unit Schedule

Topic	Material Covered
1	Experiments, sample spaces, Probability Rules, Permutations and Combinations.
2	Conditional Probability. Independence, Bayes' Theorem.
3	Random Variables. Probability Functions, Discrete Probability Distributions, Cumulative Distribution functions, Expected value and Variance. Moments.
4	Important Discrete Distributions: Bernoulli, Binomial, Geometric and Poisson.
5	Moment generating functions. Discrete Distributions: Negative Binomial and Hypergeometric.
6	Introduction to Continuous random variables. Cumulative distribution function.
7	Continuous Distributions: Uniform, Exponential.
8	Normal distribution.
9	Continuous Distributions: Gamma and Beta Distributions. Chebyshev's Theorem.
10	Sampling Distributions.

Topic	Material Covered
11	Joint Distributions: Discrete and Continuous cases.
12	Introduction to stochastic processes. Markov Chains.

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
- 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). 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 connect.mq.edu.au or if you are a Global MBA student contact 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/

Academic Success

Academic Success 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/.

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

Changes since First Published

Date	Description
16/02/2025	Contact information changed from "Contact via Contact via email" to "Contact via email".

Unit information based on version 2025.01R of the Handbook