STAT6039

Principles of Mathematical Statistics

Course Description

A first course in mathematical statistics with emphasis on applications; probability, random variables, moment generating functions and correlation, sampling distributions, estimation of parameters by the methods of moments and maximum likelihood, hypothesis testing, the central limit theorem, simple linear regression

Mode of Delivery	On campus by way of lectures and tutorials
Prerequisites	To enrol in this course you must have completed MATH1113 or MATH1116 or MATH1014, and either STAT1003 or STAT1008; or be enrolled in the Master of Actuarial Studies, Master of Actuarial Practice or Master of Statistics.
Incompatible Courses	None
Co-taught Courses	**STAT2001**. Graduate students attend joint classes with undergraduates but are assessed separately.
Course Convener:	Dr Borek Puza
Phone:	+61 2 612 54587
Email:	borek.puza@anu.edu
Office hours for student consultation:	To be advised on Wattle in due course
Research Interests:	Bayesian statistics, Monte Carlo methods, confidence estimation, statistical paradoxes
Administrator	Anna Pickering
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Lecturers	Dr Borek Puza and Dr Yanrong Yang
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Office hours for student consultation:	To be advised on Wattle in due course
Tutors	To be advised on Wattle in due course

COURSE OVERVIEW

Learning Outcomes

Upon successful completion of the requirements for this course, students should have the knowledge and skills to demonstrate a high level of understanding and be able to communicate the following topics:

- LO1: Introductory probability including combinatorics and Bayes' theorem
- LO2: Discrete random variables and their probability distributions
- LO3: Continuous random variables and their probability distributions
- LO4: Multivariate random variables and their probability distributions
- LO5: Sampling distributions and the central limit theorem
- LO6: The method of moments and maximum likelihood estimation
- LO7: Confidence estimation and hypothesis testing
- **LO8: Simple linear regression**

Assessment Summary

Assessment Task	Value	Due Date	Date for Return of Assessment	Linked Learning Outcomes
1. Quiz	**0% (for self-assessment)**	Wed 15 March (Week 4)	Wed 22 March (Week 5)	LO1; Chapters 1 and 2
2. Assignment 1	**10%**	12 noon Wed 29 March (Week 6)	by Wed 19 April (Week 6)	LO1; Chapters 1 and 2.
3. Assignment 2	**10%**	12 noon Wed 17 May (Week 11)	by Wed 31 May (week after Week 12)	LO1, LO2, LO3, and LO4; Chapters 1 to 6
4. Mid-semester Exam	**20% or 0% (redeemable as detailed below)**	Probably in Week 7 (to be decided later)	Probably by Wed 3 May (Week 9)	LO1 and LO2; Chapters 1, 2 and 3
5. Final Exam	**60% or 80%**	Final examination period		LO1 to LO7; Chapters **1 to 11**

Research-Led Teaching

If time permits, the lecturers may illustrate selected topics by discussing relevant examples from papers they have published. New material in these examples will not be assessable.

Feedback

Staff Feedback

Students will be given feedback in the following forms in this course:
- Verbal communication from lecturers and tutors, individually upon request.
- Marks and summaries for the quiz, assignments and mid-semester exam.

Student Feedback

ANU is committed to the demonstration of educational excellence and regularly seeks feedback from students. One of the key formal ways students have to provide feedback is through Student Experience of Learning Support (SELS) surveys. The feedback given in these surveys is anonymous and provides the Colleges, University Education Committee and Academic Board with opportunities to recognise excellent teaching, and opportunities for improvement.

For more information on student surveys at ANU and reports on the feedback provided on ANU courses, go to
http://unistats.anu.edu.au/surveys/selt/students/ and
http://unistats.anu.edu.au/surveys/selt/results/learning/

Policies

ANU has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and implement them. You can find the University's education policies and an explanatory glossary at:
http://policies.anu.edu.au/

Students are expected to have read the Academic Misconduct Rule before the commencement of their course.

Other key policies include:

- Student Assessment (Coursework)
- Student Surveys and Evaluations

Additional course costs

Students will need to own or borrow a **non**-programmable scientific calculator.

Recommended Resources

Prescribed text and solutions manual (not compulsory but highly recommended):

Wackerly, D.D., Mendenhall III, W., and Scheaffer, R.L. (2008). Mathematical
    Statistics with Applications, Seventh edition. Duxbury, Thomson, Brooks/Cole.

Owen, W.J. (2008). Student Solutions Manual for Wackerly, Mendenhall, and
    Scheaffer's Mathematical Statistics with Applications, Seventh Edition.
    Duxbury, Thomson, Brooks/Cole.

Other recommended texts (amongst much similar material in the Hancock Library):

Miller, I., and Miller, M. (2014). John E. Freund's Mathematical Statistics with Applications,
    Eighth Edition. Pearson.

Spiegel, M.R., Schiller, J.J., and Srinivasan, R.A. (2013). Schaum's Outline of Probability
    and Statistics, Fourth Edition. McGraw-Hill.

COURSE SCHEDULE

Week/Session	Summary of Activities	Assessment
0	*Orientation Week*	
1	Chapter 1: Introduction, and Chapter 2: Probability	
2	Chapter 2: Probability	
3	Chapter 2: Probability	
4	Chapter 3: Discrete random variables	Quiz
5	Chapter 4: Continuous random variables	
6	Chapter 5: Multivariate random variables	Assignment 1
	Two-week teaching break	
7	Chapter 6: Functions of random variables	Mid-semester Exam (probably this week)
8	Chapter 7: Sampling distributions and the central limit theorem	
9	Chapter 8: Point and interval estimation	
10	Chapter 9: Methods for point estimation	
11	Chapter 10: Hypothesis testing	Assignment 2
12	Chapter 11: Simple linear regression (taught to all students but assessable only for STAT6039 students; not assessable for STAT2001 students)	
	Final exam study period (at least one week)	
	Examination period	Final examination

ASSESSMENT REQUIREMENTS

Assessment for this course consists of a quiz, two assignments and two exams as detailed above and below. Attendance and participation in lectures and tutorials is not assessable.

STAT6039 is co-taught with STAT2001 Introduction to Mathematical Statistics. STAT2001 students will have slightly different learning outcomes and assessment. They will also be allocated to separate tutorial groups. Tutorial questions will be the same for both cohorts.

Assessment Tasks

Assessment Task 1: Quiz

Details of task: This consists of a set of problems that will be made available on Wattle in Week 4. The problems will relate to material in Chapters 1 and 2 only. Students will be able mark their own quizzes using solutions posted on Wattle in Week 5. This quiz is solely for self-assessment purposes and will not contribute towards students' final marks and grades.

Assessment Task 2: Assignment 1

Details of task: This assignment covers Chapters 1 and 2 and is worth 10% of the total assessment. The assignment will be due in Week 6 and returned to students by Week 7.

Assessment Task 3: Assignment 2

Details of task: This assignment covers Chapters 1 to 6 and is worth 10% of the total assessment. The assignment will be due in Week 11 and returned within two weeks.

Assessment Task 4: Mid-semester exam

Details of task: This exam covers Chapters 1, 2 and 3 and is worth either 20% of the total assessment or 0% (if it is redeemed, as detailed below). The exam will probably be in Week 7 (with the exact date and venue to be announced and placed on Wattle in due course).

Assessment Task 5: Final exam

Details of task: This exam covers Chapters **1 to 11** and is worth either 60% of the total assessment or 80% (as detailed below). The exam will be in the final examination period (with the exact date and venue to be announced and placed on Wattle in due course).

Examinations

Both the mid-semester and final exams will be **open book**, with permitted materials being a "**Non**-programmable calculator" and otherwise "**No restrictions**", apart from items excluded by general ANU examinations policy (such as mobile phones). The mid-semester exam will cover Chapters 1 to 3 only. The final exam will cover Chapters **1 to 11 (all)**. These details may change. Students should check them prior to each exam, at http://timetable.anu.edu.au/

The mid-semester exam will be redeemable, meaning that you will get the better of the two breakdowns 20 + 60 and 0 + 80. Thus, if you do better in the final exam than in the mid-semester exam (or do not attempt the mid-semester exam), your mid-semester exam will not count and your final exam will count 80%. Although the mid-semester exam is redeemable and optional, students are advised to do it if possible.

Some exam questions may be significantly more difficult than questions in lectures, tutorials and assignments. Prior to each exam, several past exams with solutions will be made available on Wattle. In addition to giving an idea of the upcoming exam, past exams provide a useful source of additional exercises and should be studied in detail. If time permits, several questions from past exams will be discussed in class.

Assignment submission

The assignments are to be typed or handwritten and handed in to the RSFAS Office, or placed in a designated box nearby (with details to be announced on Wattle in due course).

Assignments must include the cover sheet available [here](). Please keep a copy of tasks completed for your records.

Extensions and penalties

No submission of assessment tasks without an extension after the due date will be permitted. If an assessment task is not submitted by the due date, a mark of 0 will be awarded

Returning assignments

Marked assignments can be collected from the filing cabinets in the foyer outside the RSFAS Office on the 4th floor of the CBE Building (26C).

Resubmission of assignments

It will not be possible for assignments to be resubmitted.

Referencing requirements

In assignments and exams, students must appropriately reference any results, words or ideas that they take from another source which is not their own. A guide can be found at: https://academicskills.anu.edu.au/resources/handouts/referencing-basics

Scaling

Your final mark for the course will be based on the **raw** marks allocated for each of your assessment items. However, your final mark may not be the same number as produced by that formula, as marks may be **scaled**. Any scaling applied will preserve the rank order of raw marks (i.e. if your raw mark exceeds that of another student, then your scaled mark will exceed the scaled mark of that student), and may be either up or down.

Privacy Notice

The ANU has made a number of third party, online, databases available for students to use. Use of each online database is conditional on student end users first agreeing to the database licensor's terms of service and/or privacy policy. Students should read these carefully.

In some cases student end users will be required to register an account with the database licensor and submit personal information, including their: first name; last name; ANU email address; and other information.

In cases where student end users are asked to submit 'content' to a database, such as an assignment or short answers, the database licensor may only use the student's 'content' in accordance with the terms of service – including any (copyright) licence the student grants to the database licensor.

Any personal information or content a student submits may be stored by the licensor, potentially offshore, and will be used to process the database service in accordance with the licensors terms of service and/or privacy policy.

If any student chooses not to agree to the database licensor's terms of service or privacy policy, the student will not be able to access and use the database. In these circumstances students should contact their lecturer to enquire about alternative arrangements that are available.

Tutorial Seminar Registration

Tutorial signup for this course will be done via the Wattle website. Detailed information about signup times will be provided on Wattle or during your first lecture. When tutorials are available for enrolment, follow these steps:

1. Log on to Wattle, and go to the course site
2. Click on the link "Tutorial enrolment"
3. On the right of the screen, click on the tab "Become Member of….." for the tutorial class you wish to enter
4. Confirm your choice

If you need to change your enrolment, you will be able to do so by clicking on the tab "Leave group…." and then re-enrol in another group. You will not be able to enrol in groups that have reached their maximum number. Please note that enrolment in ISIS must be finalised for you to have access to Wattle.

SUPPORT FOR STUDENTS

The University offers a number of support services for students. Information on these is available online from http://students.anu.edu.au/studentlife/