STAT2001/STAT6039
Introductory Mathematical Statistics/
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.

<table>
<thead>
<tr>
<th>Semester and Year</th>
<th>S2 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of Delivery</td>
<td>Lectures and tutorials on campus</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>To enrol in this course you must have completed MATH1113 or MATH1116 (H) or MATH1014, and either STAT1003 or STAT1008</td>
</tr>
<tr>
<td>Incompatible Courses</td>
<td>None</td>
</tr>
<tr>
<td>Course Convener</td>
<td>Dr. Anton Westveld</td>
</tr>
<tr>
<td>Office Location:</td>
<td>CBE 3.03</td>
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<td>Phone:</td>
<td>+61 2 6125 5122</td>
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<tr>
<td>Email:</td>
<td><a href="mailto:anton.westveld@anu.edu.au">anton.westveld@anu.edu.au</a></td>
</tr>
<tr>
<td>Consultation hours:</td>
<td>To be advised, or by appointment</td>
</tr>
<tr>
<td>Research interests</td>
<td>Bayesian methodology and theory; statistical methods for interaction/relational data.</td>
</tr>
<tr>
<td>Student administrator</td>
<td>Anna Pickering</td>
</tr>
<tr>
<td>Phone</td>
<td>(02) 61259045</td>
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<td>Email</td>
<td><a href="mailto:anna.pickering@anu.edu.au">anna.pickering@anu.edu.au</a></td>
</tr>
<tr>
<td>Tutors</td>
<td>To be advised on the Wattle site for this course</td>
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</table>
COURSE OVERVIEW

Course Learning Outcomes
Upon successful completion of the requirements for this course, students will achieve an understanding of and facility in the following topics:

- Introductory probability including combinatorics and Bayes' theorem
- Discrete random variables and their probability distributions
- Continuous random variables and their probability distributions
- Multivariate random variables and their probability distributions
- Sampling distributions and the central limit theorem
- The method of moments and maximum likelihood estimation
- Confidence estimation and hypothesis testing
- Simple linear regression

Research-Led Teaching
If time permits, the lecturer may illustrate selected topics by discussing relevant examples from his own published or current work. These examples will not be assessable.

Technology, Software, Equipment
Some examples provided in lecture, tutorial, and potentially some questions in the assignments will entail the use of the statistical computer package R, which is freely available at www.r-project.org. The program code used for examples provided in lecture and tutorial will available on the course Wattle site. Note: students will not be able to use R during the exams.

Additionally, you will need a scientific calculator that you are able to use during exams.

Student Feedback
All CBE courses are evaluated using Student Experience of Learning and Teaching (SELT) surveys, administered by Planning and Statistical Services at the ANU. These surveys are offered online, and students will be notified via email to their ANU address when surveys are available in each course. Feedback is used for course development so please take the time to respond thoughtfully. Course feedback is anonymous and provides the Colleges, University Education Committee and Academic Board with opportunities to recognise excellent teaching and to improve courses across the university. For more information on student surveys at ANU and reports on feedback provided on ANU courses, visit

http://unistats.anu.edu.au/surveys/selt/students/ and
http://unistats.anu.edu.au/surveys/selt/results/learning/
# COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Week (Monday date)</th>
<th>An approximate guideline of topics to be covered</th>
<th>Activity</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Orientation Week</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (21 July)</td>
<td>MWS Chapter 1: Introduction</td>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>2 (28 July)</td>
<td>MWS Chapter 2: Probability</td>
<td>Lectures, Tutorial</td>
<td></td>
</tr>
<tr>
<td>3 (4 August)</td>
<td>MWS Chapter 2: Probability</td>
<td>Lectures, Tutorial</td>
<td></td>
</tr>
<tr>
<td>4 (11 August)</td>
<td>MWS Chapter 3: Discrete random variables</td>
<td>Lectures, Tutorial</td>
<td></td>
</tr>
<tr>
<td>5 (18 August)</td>
<td>MWS Chapter 4: Continuous random variables</td>
<td>Lectures, Tutorial</td>
<td></td>
</tr>
<tr>
<td>6 (25 August)</td>
<td>MWS Chapter 5: Multivariate random variables</td>
<td>Lectures, Tutorial</td>
<td>Assignment 1 due at 16:00 on Fri 29 Aug.</td>
</tr>
<tr>
<td>7 (1 September)</td>
<td>MWS Chapter 6: Functions of random variables</td>
<td>Lectures, Tutorial</td>
<td></td>
</tr>
<tr>
<td><strong>Two-week teaching break</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 (22 September)</td>
<td>MWS Chapter 7: Sampling distributions and the central limit theorem</td>
<td>Lectures, Tutorial</td>
<td>Mid-semester exam (exact date TBD)</td>
</tr>
<tr>
<td>9 (29 September)</td>
<td>MWS Chapter 8: Point and interval estimation</td>
<td>Lectures, Tutorial</td>
<td></td>
</tr>
<tr>
<td>10 (6 October)</td>
<td>MWS Chapter 9: Methods for point estimation</td>
<td>Lectures, Tutorial</td>
<td></td>
</tr>
<tr>
<td>11 (13 October)</td>
<td>MWS Chapter 10: Hypothesis testing</td>
<td>Lectures, Tutorial</td>
<td></td>
</tr>
<tr>
<td>12 (20 October)</td>
<td>MWS Chapters 11 &amp; 13: Simple linear regression and ANOVA (assessable for STAT6039 students only)</td>
<td>Lectures, Tutorial</td>
<td>Assignment 2 due at 16:00 on Fri 24 Oct.</td>
</tr>
<tr>
<td>13 (27 October)</td>
<td>Revision</td>
<td>Lectures, Tutorial</td>
<td></td>
</tr>
<tr>
<td><strong>Examination period</strong></td>
<td></td>
<td></td>
<td>Final exam</td>
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</tbody>
</table>
Details regarding course material

The course primarily consists of chapters 1-11 and 13 (partial or full chapters) in the textbook (MWS). Chapters 11 and 13 in the textbook are assessable only for STAT6039 students. They are not assessable for STAT2001 students. Exactly which sections in the textbook are relevant and assessable will be available on Wattle.

It is possible that some material may be presented in class, which is assessable, but not in the textbook or on Wattle.

PROPOSED ASSESSMENT

Assessment for this course will be confirmed after consultation with students at the first lecture of the semester. If there are any changes to the assessment, those changes will be publicised on Wattle.

Assessment Summary

<table>
<thead>
<tr>
<th>Assessment task</th>
<th>Description</th>
<th>Requirements</th>
<th>Due date</th>
<th>Value (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two assignments</td>
<td>Assignments on selected topics</td>
<td>See below</td>
<td>Weeks 6 and 12</td>
<td>10% each</td>
</tr>
<tr>
<td>Mid-Semester Examination</td>
<td>Redeemable exam on material from weeks 1-5</td>
<td>See below</td>
<td>In Week 8 (exact date TBD)</td>
<td>20% or 0%, redeemable in favour of the Final</td>
</tr>
<tr>
<td>Final Examination</td>
<td>Compulsory exam on material from weeks 1-11 or weeks 1-12</td>
<td>See below</td>
<td>During the final exam period</td>
<td>60% or 80%</td>
</tr>
</tbody>
</table>

Participation

Attendance is not compulsory. However, it is strongly recommended that students attend all lectures and their designated tutorial each week.

Assessment Task 1: Assignment 1
Scope: Material from weeks 1-4
Value: 10%
Presentation: Handwritten or typed (see below for more details)
Due date: 16:00 on Friday 29 August (Week 6)

Assessment Task 2: Assignment 2
Scope: Material from weeks 1-9
Value: 10%
Presentation: Handwritten or typed (see below for more details)
Due date: 16:00 on Friday 24 October (week 12).
**Assessment Task 3:** Mid-Semester Examination  
Scope: Material from weeks 1-5  
Value: 20% or 0%, redeemable in favour of the Final (see below)  
Date: Week 8 (date to be determined later)

**Assessment Task 4:** Final Examination  
Scope:  
- Material from weeks 1-11 (STAT2001)  
- Material from weeks 1-12 (STAT6039)  
Value: 80% or 60% (see below)  
Date: Final examination period

**Assignments (details)**  
Assignments are to be worked on alone. Solutions may be typed or neatly handwritten. Please show all of your work, present your solutions in coherent English, and draw a box around each required result. Calculations may be done either using a hand-held calculator or using the statistical software R. If a computer is used to do the calculations, the code should be provided as an appendix to the assignment. Solutions consisting merely of annotated computer code are not acceptable.

**Assignment Submission**  
Assignments are submitted using the course Wattle site. Submitted assignments must include the cover sheet provided on Wattle. Please keep a copy of the assignment for your records. The university prefers assignments to be submitted online. Only if necessary (deemed by the lecturer), other submission venues will be discussed in class and will be posted on Wattle.

The ANU is using Turnitin to enhance student citation and referencing techniques, and to assess assignment submissions as a component of the University's approach to managing Academic Integrity. For additional information regarding Turnitin please visit ANU Online.

**Extensions and Penalties**  
No extensions will be given unless arranged before the due date and accompanied by a medical certificate. Late assignments without an extension will be marked zero.

**Returning Assignments**  
Grading and comments will be provided via Wattle if the assignments are submitted online. The university prefers assignments to be submitted online. If the lecturer deems other submission venues necessary, then the method for returning assignments will be discussed in class, as well as posted on Wattle.

**Resubmission of Assignments**  
It will not be possible for assignments to be resubmitted.

**Examinations**  
The permitted material for the mid-semester and final exams will be:  
- A4 pages (Two sheets) with notes on both sides  
- Paper-based dictionary, no approval required (must be clear of ALL annotations)  
- Calculator (Any - programmable or not)
The mid-semester exam will cover material from weeks 1-5.

For STAT2001 students, the final exam will cover material from weeks 1-11. For STAT6039 students, the final exam will cover material from weeks 1-12.

The final exam will contain an extra question for STAT6039 students, most likely from the material in week 12. Again, this will be the only additional assessment for STAT6039 students.

The mid-semester exam is redeemable, meaning that you will get the better of the two breakdowns 20+60 and 0+80. That is, if you do better in the final exam than in the mid-semester exam, your mid-semester exam will not count and your final exam will count 80%. If you do not sit the mid-semester exam, your final exam will definitely count 80%.

Although the mid-semester exam is redeemable and optional, it is advised that students do it if possible. No special provision will be made for students who cannot sit the mid-semester exam. That is, there will be no special mid-semester exams.

**Scaling**

Your final mark for the course will be based on the raw marks allocated for each assignment or examination. 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 or equal the scaled mark of that student), and may be either up or down.

**READING LISTS**

**Prescribed Texts**


**Highly Recommended Reading but not Prescribed**


This is a popular science book on probability and statistics, however it is not available in Australia. Through the author’s webpage for the book you can find information about how you may purchase it from other countries ([http://probability.ca/sbl/](http://probability.ca/sbl/)).
**Recommended Reading**


**Tutorial and/or Seminar signup**
Enrolment in tutorials will be completed online using the CBE Electronic Teaching Assistant (ETA). To enrol, follow these instructions:

2. You will see the Student Login page. To log into the system, enter your University ID (your student number) and password (your ISIS password) in the appropriate fields and hit the Login button.
3. Read any news items or announcements.
4. Select "Sign Up!" from the left-hand navigation bar.
5. Select your courses from the list. To select multiple courses, hold down the control key. On PCs, this is the Ctrl key; on Macs, it is the ⌘ key. Hold this key down while selecting courses with the mouse. Once courses are selected, hit the SUBMIT button.
6. A confirmation of class enrolments will be displayed. In addition, an email confirmation of class enrolments will be sent to your student account.
7. For security purposes, please ensure that you click the LOGOUT link on the confirmation page, or close the browser window when you have finished your selections.
8. If you experience any difficulties, please contact the School Office (see page 1 for contact details).
9. Students will have until the end of week 2 to finalise their enrolment in tutorials. After this time, students will be unable to change their tutorial enrolment.

**COMMUNICATION**

**Email**
If necessary, the lecturers and tutors for this course will contact students on their official ANU student email address. Information about your enrolment and fees from the Registrar and Student Services' office will also be sent to this email address.

**Announcements**
Students are expected to check the Wattle site for announcements about this course, e.g. changes to timetables or notifications of cancellations. Notifications of emergency cancellations of lectures or tutorials will be posted on the door of the relevant room.
Course URLs

STAT6039:  http://programsandcourses.anu.edu.au/course/STAT6039

More information about this course may be found on:

• Programs and Courses (http://programsandcourses.anu.edu.au/2014/Catalogue)

• The College of Business and Economics website (http://cbe.anu.edu/courses) and

• Wattle (https://wattle.anu.edu.au), the University's online learning environment. Log on to Wattle using your student number and your ISIS password.

POLICIES

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

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 Student Academic Integrity Policy before the commencement of their course.

Other key policies include:

• Student Assessment (Coursework)
• Student Surveys and Evaluations
• Assessment of Student Learning