STAT1003
Statistical Techniques

Course Description

This course introduces students to the philosophy and methods of modern statistical data analysis and inference, with a particular focus on applications to the life sciences.

Why and how to use: tables to organise and summarise data; graphics to present statistical information; measures of location and spread for univariate distributions. Concepts of randomness, uncertainty, random variables, probability distributions (including uniform, binomial, normal), and sampling distributions and how to apply these for inference from small and large samples through: confidence intervals; hypothesis testing in one and two sample cases; p-values; linear regression models and analysis of variance. Examples and applications will be drawn extensively from the life sciences, particularly Biology. The course has a strong emphasis on computing and graphical methods, and uses a variety of real-world problems to motivate the theory and methods required for carrying out statistical data analysis. This course makes extensive use of the R statistical analysis package interfaced through R Studio.

<table>
<thead>
<tr>
<th>Mode of Delivery</th>
<th>On campus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>None</td>
</tr>
<tr>
<td>Incompatible Courses</td>
<td>You are not able to enrol in this course if you have completed STAT1008.</td>
</tr>
<tr>
<td>Co-taught Courses</td>
<td>None</td>
</tr>
<tr>
<td>Course Convenor</td>
<td>Dr Laurence Field</td>
</tr>
<tr>
<td>Phone:</td>
<td>02 6125 6710</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:laurence.field@anu.edu.au">laurence.field@anu.edu.au</a></td>
</tr>
<tr>
<td>Office hours for student consultation:</td>
<td>Please see the Wattle site.</td>
</tr>
<tr>
<td>Research Interests</td>
<td>Stochastic Processes</td>
</tr>
<tr>
<td>Tutor</td>
<td>Chen Tang</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:chen.tang@anu.edu.au">chen.tang@anu.edu.au</a></td>
</tr>
<tr>
<td>Student Administrator</td>
<td>Tracy Skinner</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:tracy.skinner@anu.edu.au">tracy.skinner@anu.edu.au</a></td>
</tr>
</tbody>
</table>

SEMESTER 1
2018
COURSE OVERVIEW

Learning Outcomes

Upon successful completion of the requirements for this course, students should have the knowledge and skills to:

- Summarise and graph data appropriately;
- Work with random variables and probability distributions and understand the rationale behind them;
- Understand and use the normal distribution appropriately;
- Identify when and how to carry out basic statistical inference including confidence intervals, hypothesis testing, regression and ANOVA; and,
- Identify contexts in which a method may be appropriate (e.g. using a large sample method when sample size is small).

Assessment Summary

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Value</th>
<th>Due Date</th>
<th>Date for Return of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wattle Quiz</td>
<td>5% (redeemable)</td>
<td>Week 5</td>
<td>Week 5</td>
</tr>
<tr>
<td>Mid-Semester Examination</td>
<td>20% (redeemable)</td>
<td>Week 6 or 7 (TBC)</td>
<td>Week 7 or 8</td>
</tr>
<tr>
<td>Assignment</td>
<td>10%</td>
<td>Week 11</td>
<td>Week 12</td>
</tr>
<tr>
<td>Final Examination</td>
<td>65%</td>
<td>Examination Period</td>
<td>TBA by RSFAS</td>
</tr>
</tbody>
</table>

Research-Led Teaching

This course aims to provide you with a foundation in statistical thinking and evidence-based logic, two elements that are integral to any academic program and life in the work force beyond your university degree. Almost all areas of research require both elements. Any research that involves data also involves statistical computing. We do so with R (https://www.r-project.org) interfaced through R Studio (https://www.rstudio.com) at an elementary level.

I will also introduce examples, whenever applicable, from my current research areas in class to further illustrate concepts and the use of statistics.

Feedback

Staff Feedback

Students will be given feedback in the following forms in this course:

- Written feedback for one mid-semester examination and one assignment;
- An online Wattle Quiz in Week 5 that will be automatically graded;
- Feedback during tutorial/lab sessions;
- In-person consultation with the lecturer or tutor during office hours;
- Online discussion on the course forum on the Wattle page.
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

Required Resources

  https://www.openintro.org/stat/textbook.php
- Hand-held non-programmable calculator

Additional course costs
Students will be expected to own or borrow a hand-held non-programmable calculator.

Examination material or equipment
More information on this will be provided later.

Recommended Resources

### COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Summary of Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to data I (Chapter 1)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Introduction to data II (Chapter 1)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Elementary probability I (Chapter 2)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Elementary probability II (Chapter 2)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Distributions of random variables I (Chapter 3)</td>
<td>Wattle Quiz</td>
</tr>
<tr>
<td>6</td>
<td>Distributions of random variables II (Chapter 3)</td>
<td>Mid-semester Examination (Week 6 or 7, TBC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teaching break</td>
</tr>
<tr>
<td>7</td>
<td>Foundations of inference I (Chapter 4)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Foundations of inference II (Chapter 4)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Further inference (selected topics in chapters 5 and 6)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Linear Regression I (Chapter 7)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Linear Regression II (Chapter 7)</td>
<td>Assignment</td>
</tr>
<tr>
<td>12</td>
<td>Catch-up/Review</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Examination period</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Final Examination</td>
</tr>
</tbody>
</table>

### ASSESSMENT REQUIREMENTS

As an academic integrity control, students may be selected for a 15 minute individual oral examination of their written assessment submissions.

Any student identified, either during the current semester or in retrospect, as having used ghost writing services will be investigated under the University's Academic Misconduct Rule.

### Assessment Tasks

**Assessment Task 1:** Wattle Quiz (5%, redeemable)

**Details of task:** An online Wattle Quiz will be held during week 5, covering material from Weeks 1–4, inclusive. The quiz is redeemable and optional for this course. No deferred quiz will be offered; instead, the weighting will be moved to the final examination.
Assessment Task 2: Mid-Semester Examination (20%, redeemable)

Details of task: The mid-semester examination will be held during week 6 or 7 (subject to confirmation from the Examinations Office), covering material from Weeks 1–6, inclusive. It will be a 1½-hour closed-book examination. The mid-semester examination is redeemable and optional for this course. No deferred mid-semester examination will be offered; instead, the weighting will be moved to the final examination.

Assessment Task 3: Assignment (10%)

Details of task: Answer specified questions based on materials from Weeks 1–10. You may type your answer in a word-processing program or you may handwrite parts of your answers. Please ensure that your handwriting is legible. The questions may require you to include certain R output. Although verbal discussions with others (fellow students, tutors, lecturer) are encouraged, the contents of your assignment must be produced by you as an individual and must comply with academic integrity policies given at http://www.anu.edu.au/students/program-administration/assessments-exams/academic-honesty-plagiarism and https://www.cbe.anu.edu.au/current-students/policies/examinations-assessment/plagiarism-and-academic-misconduct/.

Assessment Task 4: Final Examination (65%)

Details of task: The final examination will be 3-hour closed-book examination. Each student will be allowed to bring in a single handwritten double-sided A4 sheet of notes.

Examinations

Allowed materials:

Mid-semester and final examinations: hand-held non-programmable calculator, pen and/or pencils. Final examination only: handwritten notes on one sheet of double-sided A4 paper.

Prohibited materials:

Mid-semester and final examinations: communication devices (computers, tablets, mobile phones, smart watches, etc.).

Assignment submission

Hard Copy Submission: Students should submit the assignment to the assignment box under the correct course/tutorial label near the RSFAS admin office on Level 4, CBE building. Assignments must include the cover sheet. Please keep a copy of tasks completed for your records.
Extensions and penalties

Extensions and late submission of assessment pieces are covered by the Student Assessment (Coursework) Policy and Procedure.

Late submissions of the assignment will not be considered for grading regardless of any reasons provided. However, if you have documented and appropriate medical evidence that demonstrates you were not able to submit the assignment on time, the Course Convenor may grant permission to make the assignment redeemable at the final exam.

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 the mid-term examination and assignment

The mid-term examination and assignment will be graded and returned in tutorials. Uncollected assignments may be picked up from the drawers on Level 4, CBE building.

Resubmission of the assignment

Resubmission of the assignment is not allowed under any circumstance.

Referencing requirements

Although formal scholarly referencing may not be necessary for the assignment, you must adhere to academic integrity policies (see details of Assessment Task 3).

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/](http://students.anu.edu.au/studentlife/)