**Mode of Delivery**  
On campus, plus additional outside study time

**Prerequisites**  
To enrol in this course, you must have completed STAT3013

**Incompatible Courses**

**Co-taught Courses**

**Course Convener:**  
Professor Alan Welsh

**Phone:**  
612 59773

**Email:**  
Alan.Welsh@anu.edu.au

**Office hours for student consultation:**  
Outside of teaching times I will be available for consultation in my office by appointment (EXCEPT on Mondays). You can make an appointment by e-mail, preferably one or two days in advance. You can drop in and see me when I am in my office, however, if you want to be sure I will be available at a particular time it is a good idea to make an appointment.

**Research Interests**  
Statistical Inference, Statistical Modelling, Robustness, Nonparametric and Semi-Parametric methods, Analysis of Sample Surveys, Ecological Monitoring.

**Relevant administrator if any (optional)**  
Colleen Lee

**Phone:**

**Email:**  
colleen.lee@anu.edu.au

**Lecturer(s)**

**Phone(s):**

**Email(s):**

**Office hours for student consultation:**

**Tutor(s)**  
Information about tutors will be provided on Wattle (https://wattle.anu.edu.au)

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**SEMESTER 2**

**2017**
COURSE OVERVIEW

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

- have an in depth understanding of how to carry out maximum likelihood estimation and inference in statistical models with several parameters.
- be able to apply Taylor series expansions to derive approximate sampling distributions and confidence intervals for vectors of transformed estimators.
- understand the concepts of robust estimation in statistics, including the role of influence functions, be able to apply them to evaluate the robustness of estimators and understand how to construct bounded influence robust estimators.
- have an in depth understanding and be able to explain the different uses of randomisation in statistics.
- have an in depth understanding of the basic principles of statistical inference and the issues they raise about how to do statistical inference.

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>0. Tutorial participation</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Assignment 1</td>
<td>15%</td>
<td>1 September 2017</td>
<td>22 September 2017</td>
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<tr>
<td>2. Assignment 2</td>
<td>15%</td>
<td>6 October 2017</td>
<td>20 October 2017</td>
</tr>
<tr>
<td>3. Final Exam</td>
<td>65%</td>
<td>During Exam Period</td>
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Research-Led Teaching
This course draws on the active research interests of the course convenor. These include the directly relevant topics of Statistical Inference, Statistical Modelling, Robustness, Nonparametric and Semi-Parametric methods, Analysis of Sample Surveys.

Feedback

Staff Feedback: General feedback to students will be given to the whole class in lectures and tutorials. Specific feedback will be given to students on their graded assignments.

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.

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

Additional course costs
There are no additional costs that students undertaking this subject incur.

Examination material or equipment
The only materials permitted to students will be an A4 page with handwritten notes on a single side prepared by the individual students.

COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Week/Session</th>
<th>Summary of Activities</th>
<th>Assessment</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>Review of likelihood theory</td>
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<tr>
<td>2</td>
<td>Large sample theory</td>
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<tr>
<td>3</td>
<td>Likelihood-based confidence intervals and tests</td>
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<tr>
<td>4</td>
<td>Introduction to robustness</td>
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<tr>
<td>5</td>
<td>Functional calculus and influence functions</td>
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</tr>
<tr>
<td>6</td>
<td>More on robustness</td>
<td>Assignment 1</td>
</tr>
<tr>
<td>7</td>
<td>Randomisation</td>
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</tr>
<tr>
<td>8</td>
<td>Randomisation as a basis for inference</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>More on randomisation and inference</td>
<td>Assignment 2</td>
</tr>
<tr>
<td>10</td>
<td>The likelihood principle</td>
<td></td>
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<tr>
<td>11</td>
<td>Sufficiency and the sufficiency principle</td>
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<tr>
<td>12</td>
<td>Ancillarity and the conditionality principle</td>
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<tr>
<td></td>
<td>Examination period</td>
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</tbody>
</table>
ASSESSMENT REQUIREMENTS

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 the ANU Online website.

Students may choose not to submit assessment items through Turnitin. In this instance you will be required to submit, alongside the assessment item itself, copies of all references included in the assessment item.

As a further 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

Participation

Students are expected to attend tutorials, present solutions or attempted solutions to the class and participate in discussions of other student’s presentations. The presentations will involve writing on paper under the document camera and explaining the steps verbally to the tutorial group.

Assessment Tasks 1 and 2: Assignment 1

Details of task: Take-home problem sets. Answer all problems, showing appropriate mathematical working and discussing results where appropriate.

Assessment Rubrics

Assignments will be evaluated in terms of the correctness of answers and the appropriateness and quality of the discussion.

Value: 15% each, for both assignments

Presentation requirements: Assignments can be neatly handwritten or they can be prepared using mathematical typesetting software such as LATEX.

Estimated return date: 22 September 2017 (Assignment 1); 20 October 2017 (Assignment

Examination(s)

The course assessment will include a formal 3 hour examination (with 15 minutes reading time) scheduled in the 2nd Semester Examination Period. The examination will cover the entire course content.

Assignment submission

Assignments may be submitted either electronically through the course Wattle site (You will be required to electronically sign a declaration as part of the submission of your assignment) or by hardcopy to the RSFAS Main Office. Email and fax submissions are not acceptable. Assignments must include the cover sheet available here. Please keep a copy of the assignment for your records.
Extensions and penalties
Extensions and late submission of assessment pieces are covered by the Student Assessment (Coursework) Policy and Procedure.

The Course Convener may grant extensions for assessment pieces that are not examinations or take-home examinations. If you need an extension, you must request it in writing on or before the due date. If you have documented and appropriate medical evidence that demonstrates you were not able to request an extension on or before the due date, you may be able to request it after the due date.

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
Assignments will be returned in the lecture on the return day and thereafter may be collected outside the RSFAS Main Office. Assignment marks will be uploaded to the Wattle gradebook feature for the course. It is the responsibility of students to check that these recorded marks are in agreement with the marks written on returned assignments.

Resubmission of assignments
No resubmission of assignments will be permitted.

Referencing requirements
Please read and observe the requirements for referencing and other guidelines in the Code of Practice for Student Academic Integrity (see the section on Policies, above).

Reading lists
The main reference (on 2 hour loan at Hancock Library) will be


Other books on statistical inference in general and on specific topics such as robustness, sample surveys etc may be useful to students.

Technology, Software, Equipment
The application of modern statistical techniques requires familiarity with one or more statistical computing packages. In this course we will make some use of the R statistical computing package to do some numerical calculations, to develop examples and to illustrate points made in the lectures. R can be downloaded for free from the internet.

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
More information about this course may be found on:
• Programs and Courses (http://programsandcourses.anu.edu.au/2015/Catalogue)
• the College of Business and Economics website (http://cbe.anu.edu) 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.

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
There is a single tutorial each week, starting in week 1. All students are expected to attend and participate in the tutorial (for 5% of the assessment). There is no need to sign up for this tutorial.

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/