

## STAT 7001

# Applied Statistics

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Statistics 7001 (Applied Statistics) is a course designed for senior undergraduate and research students who need to design experiments and carry out statistical analysis of their data. Emphasis will be placed on the development of statistical concepts and statistical computing, rather than mathematical details. The content covered will be motivated by problem-solving in many diverse areas of application. The topics covered will include regression modelling with emphasis on model formulation, understanding the implication of model assumptions, diagnostic methods for model checking and interpretation, logistic regression for binary variables and binomial counts, log-linear regression for Poisson counts, and exploratory tools for summarising multivariate responses.

<b>Mode of Delivery</b>	On campus
<b>Prerequisites</b>	STAT7055
<b>Incompatible Courses</b>	STAT3008
<b>Co-taught Courses</b>	STAT3008
<b>Course Convener</b>	Dr Tao Zou
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Lecturer's Consultation Hours	Please check Wattle site for the latest information or email for appointment.
Research Interests	Financial statistics, theoretical statistical inference
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Tutor's Consultation Hours	Please check Wattle site for the latest information

SEMESTER 2  
2017

## **COURSE OVERVIEW**

### **Learning Outcomes**

Upon successful completion of the requirements for this course, students will be able to:

1. Demonstrate a deep understanding and usage of the statistical computing package R.
2. Fit simple and multiple linear regression models and demonstrate model parameters.
3. Explain in detail the relationships between a response variable and a covariate or covariates.
4. Evaluate and improve simple and multiple linear regression models based on diagnostic measures.
5. Perform model selection in a multiple linear regression modelling context.
6. Perform logistic and Poisson log-linear regression models.
7. Demonstrate multivariate analyses techniques and the bootstrap.

### **Assessment Summary**

<b>Assessment Task</b>	<b>Value</b>	<b>Due Date</b>	<b>Date for Return of Assessment</b>	<b>Linked Learning Outcomes</b>
1. Quiz (online)	10% (compulsory but redeemable)	12:00 pm, Wed, Week 5	The week after submission.	1 through 3.
2. Assignment 1	10% (optional and redeemable)	12:00 pm, Wed, Week 8	The week after submission.	1 through 5.
3. Assignment 2	10% (optional and redeemable)	12:00 pm, Wed, Week 11	The week after submission.	1 through 7.
4. Final exam	70%	TBA		1 through 7.

Due to the redeemable nature of the quiz and assignments, late submission will not be accepted without appropriate documentation.

### **Research-Led Teaching**

This course is based on fundamental statistical concepts, and focuses on linear regression models, generalized linear models, multivariate analyses and etc., which are widely used tools in every area of data-based empirical research. This course will prepare students for basic skills to analyse real data, including but not limited to selecting appropriate models for different data type, accomplishing estimation and inference for different models by using R, and interpreting the outcomes of computing.

## **Feedback**

### **Staff Feedback**

Students will be given feedback (through both verbal and written comments) in the following forms in this course:

- To the whole class during lectures.
- Within tutorials.
- Individually during consultation hours.

Students will also be given online quiz feedback on Wattle and written comments in the marked 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.

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/](http://unistats.anu.edu.au/surveys/selt/students/) and

[http : //unistats.anu.edu.au/surveys/selt/results/learning/](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 Universitys academic standards, and implement them. You can find the Universitys education policies and an explanatory glossary at: [http : //policies.anu.edu.au/](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**

The only other additional course costs are a calculator, textbook (if purchased) and printing materials.

## **Examination material or equipment**

- Calculator (non-programmable).
- Unannotated paper-based dictionary (no approval required).
- Two A4 pages with notes on both sides.

## **COURSE SCHEDULE**

<b>Week</b>	<b>Summary of Activities</b>	<b>Assessment</b>
0	Access to Wattle site for all enrolled students.	
1	Introduction and getting to know R. Simple linear regression. Lectures.	
2	Simple linear regression. Lectures and tutorials.	
3	Multiple linear regression. Lectures and tutorials.	
4	Multiple linear regression. Lectures and tutorials.	Release of Quiz on Wattle.
5	Multiple linear regression. Lectures and tutorials.	Submission of Quiz.
6	Multiple linear regression. Lectures and tutorials.	Feedback of Quiz.
7	Logistic regression. Lectures and tutorials.	Release of Assignment 1 on Wattle.
8	Logistic/Log-linear regression. Lectures and tutorials.	Submission of Assignment 1.
9	Log-linear regression. Lectures and tutorials.	Feedback of Assignment 1.
10	Multivariate analysis. Lectures and tutorials.	Release of Assignment 2 on Wattle.
11	Bootstrap. Lectures and tutorials.	Submission of Assignment 2.
12	Various topics of interest/Review. Lectures and tutorials.	Feedback of Assignment 2.
	Examination period.	Final examination.

## **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.

This course does not require students to use Turnitin for assignment submission.

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 Universitys Academic Misconduct Rule.

## **Assessment Tasks**

### **Assessment Task 1:** Quiz (online)

**Details of task:** The students will get at least 45 minutes to complete this quiz individually. This quiz is designed for assessing basic simple/multiple linear regression. Besides, this quiz is compulsory but redeemable, and is to be attempted online on Wattle. Under no circumstances will the students be able to attempt the quiz outside of the allocated time period. Announcements will be made during lectures and on Wattle site regarding the availability of the quiz. This quiz will require the use of R to analyse real data and there will be a mix of multiple choice questions and numerical evaluation questions.

## **Assessment Rubrics**

**Value:** To ensure students are able to implement, and correctly interpret the outcomes, of the methods discussed in class.

**Estimated return date:** The week after submission.

## **Assessment Tasks**

### **Assessment Task 2:** Assignment 1

**Details of task:** The students are expected to complete this assignment individually. This assignment is designed for assessing multiple linear regression and basic logistic regression. Assignments will require the use of R to analyse real data and then to summarise and report on the findings of the analysis. More details will be provided during the lectures and on Wattle.

## **Assessment Rubrics**

Assignments are expected to be printed and contain relevant computer code and graphics.

**Value:** To ensure students are able to implement, and correctly interpret the outcomes, of the methods discussed in class.

**Presentation requirements:** Students may be required to present on the findings of their assignments.

**Estimated return date:** The week after submission.

## **Assessment Tasks**

### **Assessment Task 3:** Assignment 2

**Details of task:** The students are expected to complete this assignment individually. This assignment is designed for assessing logistic/Poisson regression and some multivariate statistics. Assignments will require the use of R to analyse real data and then to summarise and report on the findings of the analysis. More details will be provided during the lectures and on Wattle.

### **Assessment Rubrics**

Assignments are expected to be printed and contain relevant computer code and graphics.

**Value:** To ensure students are able to implement, and correctly interpret the outcomes, of the methods discussed in class.

**Presentation requirements:** Students may be required to present on the findings of their assignments.

**Estimated return date:** The week after submission.

### **Examination**

The final examination will be based on all the work covered throughout the duration of the semester. The final examination is worth 70% of the overall course grade. Students will be provided with further details regarding the exam as it approaches.

### **Assignment submission**

**Hard Copy Submission:** Assignments are submitted via the physical assignment box at the front of the admin office at level 4, CBE Building (26C). The cover sheet must use the assignment cover sheet template. Assignments must include the cover sheet available on Wattle site. 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.

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**

The marked hard copy assignments will be returned to students via the admin office at level 4, CBE Building (26C).

## **Resubmission of assignments**

Resubmission of assignments will not be accepted.

## **Referencing requirements**

### **Recommended Text**

“The Statistical Sleuth” by Fred L. Ramsey and Daniel W. Schafer. This book is available in the University bookstore.

### **Supplementary Reading (Not Compulsory)**

“Analysis of Categorical Data with R” by C. R. Bilder and T. M. Loughin.

“An Introduction to the Bootstrap” by B. Efron and R. J. Tibshirani.

“The Bootstrap and Edgeworth Expansion” by P. Hall.

“Econometric Analysis” by W. H. Green.

### **Technology, Software, Equipment**

Students will be expected to learn the statistical computing package R. Details of this package will be given in the first week of lectures. Material to help students learn R will also be provided at that time.

## **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 licensors 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 students 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 licensors 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/)