

STAT2000: Applied Statistics and Research Methods

Callaghan

Semester 1 - 2024



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description	This is an applied Statistics course which will meet the needs of practitioners in a wide range of science-related disciplines as well as budding statisticians. STAT2000 builds upon the basic techniques taught in the STAT1070 course. Practical data analysis is experienced including how to design appropriate research studies and collect data.
Academic Progress Requirements	Nil
Assumed Knowledge	STAT1070 or STAT1300
Contact Hours	Callaghan Computer Lab Face to Face On Campus 2 hour(s) per week(s) for 12 week(s) Lecture Face to Face On Campus 2 hour(s) per week(s) for 13 week(s) starting Week 1
Unit Weighting Workload	10 Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

CONTACTS

Course Coordinator **Callaghan**
Marcella Papini
Marcella.Papini@newcastle.edu.au
Consultation: By appointment via email

Teaching Staff Other teaching staff will be advised on the course Canvas site.

School Office **School of Information and Physical Sciences**
SR233, Social Sciences Building
Callaghan
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9am-5pm (Mon-Fri)

SYLLABUS

Course Content The course will cover the following statistical techniques: Analysis of Variance (ANOVA)

- One-way ANOVA
- Fixed and Random Effects models
- Hierarchical and factorial ANOVA
- Associated Randomised, Randomised Complete Block and Latin Square study designs

Simple Linear Regression

- Parameter estimation and ANOVA in regression models

Multiple Regression

- Parameter estimation and Analysis of Covariance in regression models
- Model selection

Logistic Regression Non-parametric (distribution-free) tests Data collection and statistical modeling for research

- Study design and data collection concepts and principles
- Assumptions underlying statistical methods
- Power and sample size calculations
- Goodness of fit tests and model validation

Course Learning Outcomes **On successful completion of this course, students will be able to:**

1. Recognise the role of statistical methods in the development of scientific knowledge;
2. Select and implement appropriate standard experimental and observational study designs for collection of valid data in order to solve problems and answer research questions;
3. Select appropriate statistical methods to analyse particular types of data;
4. Explain the concepts of linear statistical models for a single response variable and multiple independent predictor variables;
5. Apply a statistical software package to analyse different data types, interpret results, make conclusions and effectively communicate the outcomes of the analysis.

Course Materials

Lecture Materials: Weekly lecture slides will be provided on Canvas.

Other Resources:

- Weekly lab exercises will be provided on Canvas.
- SPSS Statistical Software, jamovi, and R/RStudio are available in the University computing laboratories. Students who wish to use SPSS on their own computer are able to purchase a copy from online. Students who wish to use jamovi or R/RStudio are able to download them free from:
 - <https://www.jamovi.org/download.html>
 - <https://www.r-project.org>
 - <https://posit.co/download/rstudio-desktop/>

Recommended Reading: Course notes will be provided on Canvas..

SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	26 Feb	- Course overview - Review of hypothesis testing and confidence intervals - Type I and II errors - Power	- Lecture - Computer Lab Exercises	
2	4 Mar	- Research methods: the research process, types of studies, sampling, study design, variables, and measurements	- Lecture - Computer Lab Exercises	
3	11 Mar	- One way ANOVA including: assumptions, diagnostics, remedial measures, and post-hoc tests	- Lecture - Computer Lab Exercises	
4	18 Mar	- A priori tests for comparing multiple population means (contrasts)	- Lecture - Computer Lab Exercises	- Group Project (Proposal)
5	25 Mar	- Two way and factorial ANOVA	- Lecture - Computer Lab Exercises	
6	1 Apr	- Random effects ANOVA	- Lecture - Computer Lab Exercises	Assignment 1 due online
7	8 Apr	- Non parametric methods	- Lecture - Computer Lab Exercises	
Mid-Semester Recess				
Mid-Semester Recess				

8	29 Apr	- Correlation and simple linear regression - ANOVA approach to regression	- Lecture - Computer Lab Exercises	
9	6 May	- Multiple linear regression	- Lecture - Computer Lab Exercises	Quiz
10	13 May	- Outliers and influential points and variance inflation factors - Indicator variables	- Lecture - Computer Lab Exercises	- Group Project (Final Report)
11	20 May	- ANCOVA - Model building with transformations	- Lecture - Computer Lab Exercises	
12	27 May	- Odds and odds ratios - Logistic regression	- Lecture - Computer Lab Exercises	- Assignment 2 due online
13	3 Jun	Revision	- Lecture	
Examination Period				
Examination Period				

ASSESSMENTS

This course has 5 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Assignment 1	Before 11:59 pm Sunday 7 April (Week 6)	Individual	10%	1, 3, 5
2	Group Project	Proposal: In your allocated computer lab in Week 4 or online before 11:59 pm Sunday 24 March (Week 4). Group Project (Final Report): Before 11:59 pm Sunday 19 May (Week 10).	Group	15%	1, 2, 3, 4, 5
3	Examination - Formal	Semester 1 Examination Period	Individual	50%	1, 2, 3, 4
4	Quiz - Class	Held during allocated computer lab in Week 9.	Individual	15%	1, 3, 4, 5
5	Assignment 2	Before 11:59 pm Sunday 2 June (Week 12)	Individual	10%	1, 3, 4, 5

Late Submissions

The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assignments 1 and 2, and the Group Project (Final Report) can be submitted up to 5 days following the official due date without academic penalty, or the need to apply for adverse circumstances. The solutions to the assignments will be released after 7 days following the official due date. No assignment submissions will be accepted once the solutions have been posted.

Assessment 1 - Assignment 1

Assessment Type Description

Written Assignment

The assignments meet the objectives of knowledge acquisition and demonstrated assimilation of data, upon reflection and analysis, to apply appropriate statistical methods to given problems and scenarios. They are designed to enable students to apply skills, developed in the labs based on content in the lectures, which will be used throughout their programs and careers.

Weighting

10%

Due Date

Before 11:59 pm Sunday 7 April (Week 6)

Submission Method

Online

Assessment Criteria	Detailed assessment criteria for each assessment task and any additional material will be available on Canvas no less than two weeks prior to the due date of each assessment.
Return Method	Online
Feedback Provided	Online - . Returned online.

Assessment 2 - Group Project

Assessment Type	Report
Description	The Experiment Project gives students the opportunity to design and carry out an experiment and analyse the results using the methods covered in this course.
Weighting	15%
Due Date	Proposal: In your allocated computer lab in Week 4 or online before 11:59 pm Sunday 24 March (Week 4). Group Project (Final Report): Before 11:59 pm Sunday 19 May (Week 10).
Submission Method	Online
Assessment Criteria	Detailed assessment criteria for each assessment task and any additional material will be available on Canvas no less than two weeks prior to the due date of each assessment.
Return Method	Online
Feedback Provided	Online - . Returned online.

Assessment 3 - Examination - Formal

Assessment Type	Formal Examination
Description	The final formal examination is designed to test the individual student's knowledge of the course material and their ability to apply the methods in these material to describe, hypothesise, analyse, and interpret from a statistical perspective. Marks are awarded in accordance with Table 1 from the Grading Scales in the 2017 Course Management and Assessment Procedure Manual (Policy 000996) at http://www.newcastle.edu.au/about-uon/governance-and-leadership/policy-library/document?RecordNumber=D13_37625P
Weighting	50%
Due Date	Semester 1 Examination Period
Submission Method	Formal Exam
Assessment Criteria	Detailed assessment criteria for each assessment task and any additional material will be available on Canvas no less than two weeks prior to the due date of each assessment.
Return Method	Not Returned
Feedback Provided	No Feedback - .

Assessment 4 - Quiz - Class

Assessment Type	Quiz
Description	The quiz meets the objectives of knowledge acquisition and demonstrated assimilation of data, upon reflection and analysis, to apply appropriate statistical methods to given problems and scenarios. It is designed to enable students to apply skills, developed in the labs based on content in the lectures, which will be used throughout their programs and careers.
Weighting	15%
Due Date	Held during allocated computer lab in Week 9.
Submission Method	In Class During allocated computer lab in week 9 to your tutor.
Assessment Criteria	Detailed assessment criteria for each assessment task and any additional material will be available on Canvas no less than two weeks prior to the due date of each assessment.
Return Method	In Class
Feedback Provided	In Class - . Marked quiz will be returned during computer labs.

Assessment 5 - Assignment 2

Assessment Type	Written Assignment
Description	The assignments meet the objectives of knowledge acquisition and demonstrated assimilation of data, upon reflection and analysis, to apply appropriate statistical methods to given problems and scenarios. They are designed to enable students to apply skills, developed in the labs based on content in the lectures, which will be used throughout their programs and careers.
Weighting	10%
Due Date	Before 11:59 pm Sunday 2 June (Week 12)

Submission Method	Online
Assessment Criteria	Detailed assessment criteria for each assessment task and any additional material will be available on Canvas no less than two weeks prior to the due date of each assessment.
Return Method	Online
Feedback Provided	Online - . Returned online.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.
- Face to Face: Communication will be provided via face to face meetings or supervision.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to <https://policies.newcastle.edu.au/document/view-current.php?id=35>.

Adverse

The University acknowledges the right of students to seek consideration for the impact of

Circumstances

allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:

<https://policies.newcastle.edu.au/document/view-current.php?id=236>

Important Policy Information

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at <https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

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