



# Science

## STATS 201 : Data Analysis (15 POINTS)

### Course Prescription

A practical course in the statistical analysis of data. Interpretation and communication of statistical findings. Includes exploratory data analysis, the analysis of linear models including two-way analysis of variance, experimental design and multiple regression, the analysis of contingency table data including logistic regression, the analysis of time series data, and model selection.

### Course Overview

This is a practical course in statistical data analysis with a heavy emphasis on interpretation and communication of statistical findings. The core of the course covers linear models but the course also includes an introduction to categorical data, generalised linear models and time series. The course is taught using the R computing environment with an emphasis on reproducible research. It enables them to answer many of the commonly encountered quantitative scientific questions of interest. 201 is for any students not enrolled in the commerce faculty. Students wishing to get a major/minor in statistics should have done this course.

### Course Requirements

Prerequisite: 15 points from STATS 101-108, 191 Restriction: STATS 207, 208, BIOSCI 209

### Capabilities Developed in this Course

- Capability 1: Disciplinary Knowledge and Practice
- Capability 2: Critical Thinking
- Capability 3: Solution Seeking
- Capability 4: Communication and Engagement
- Capability 5: Independence and Integrity
- Capability 6: Social and Environmental Responsibilities

Graduate Profile: [Bachelor of Science](#)

### Learning Outcomes

By the end of this course, students will be able to:

1. Be able to select and conduct an appropriate analysis using R. (Capability 1 and 3)
2. Fit the appropriate model to a data set, modifying the model as required after checking the underlying assumptions. (Capability 1, 2, 3 and 5)
3. Use appropriate tools for exploratory data analysis. (Capability 1 and 3)
4. Identify when to apply a log transformation, know how to code this in R, interpret the overall regression model, and recognize its limitations. (Capability 1, 2 and 3)
5. Summarise the main points of exploratory and model fitting phase of the analysis using technical language. Also be able to communicate the mathematical formula for the final model fitted to the data. (Capability 1, 2, 4 and 5)
6. Use statistical findings to answer key questions in appropriate context. (Capability 1 and 3)
7. Be able to communicate the main findings from an analysis of data to those who know little or nothing about statistics. (Capability 1, 2, 4, 5 and 6)
8. Recognise and interpret output from time series models. (Capability 1, 2 and 4)

### Assessments

Assessment Type	Percentage	Classification
Assignments	28%	Individual Coursework
Online Test	20%	Individual Coursework
Exam	50%	Individual Examination
Quizzes	2%	Individual Coursework
4 types	100%	

Assessment Type	Learning Outcome Addressed							
	1	2	3	4	5	6	7	8
Assignments	✓	✓	✓	✓	✓	✓	✓	
Online Test	✓	✓	✓	✓	✓	✓	✓	
Exam	✓	✓	✓	✓	✓	✓	✓	✓
Quizzes					✓	✓	✓	

A minimum of 45% is required in the exam to pass, in addition to a minimum of 50% in overall mark.

### Tuākana

Statistics has a Tuākana Programme where there is a work space and a social space shared with Science Tuakana students. One-to-one assistance is available. We encourage students to be involved.

<https://www.auckland.ac.nz/en/science/study-with-us/maori-and-pacific-at-the-faculty/tuakana-programme.html>

## Key Topics

### Linear Models

Introduction to R. Simple Linear Models. Assumptions of the linear model. Model checks and inference. Null model (one-sample t-test). Paired t-test. Fitting curves using linear models. Quadratic models. Using categorical variables as explanatory variables. Two-sample t-tests. Multiplicative models. Working on the log scale. Power law models. Models with categorical and numeric explanatory variables (ANCOVA). Models with several explanatory variables. Multiple linear regression. Explanatory factor with multiple levels – One-way ANOVA. Multiple comparisons problem. Two-way ANOVA.

### Categorical Data and Generalised Linear Models

Count Data. The Poisson distribution. Using Poisson regression via glm. Binary responses. Using binomial glm. Modelling data from tables of counts. Odds ratios.

### Time Series

Components of a time series. Time series plots. Forecasting. Modelling time series.

## Special Requirements

The online test may be held at a time different to the lecture times. This includes the possibility that it may be held in the evening.

## Workload Expectations

This course is a standard 15 point course and students are expected to spend 25 hours per week involved in each 15 point course that they are enrolled in. (For a 6 week summer school course)

For this course, you can expect a total of 36 hours of lectures, 66 hours of reading and thinking about the content and 48 hours of work on assignments and/or test preparation.

## Delivery Mode

### Campus Experience

Lectures will be available as recordings. Other learning activities such as introductory R tutorials will be available as recordings.

Attendance on campus is not required for the test but is required for the exam.

The activities for the course are scheduled as a standard summer school weekly timetable.

## Learning Resources

All learning resources are available on Canvas.

A Coursebook containing printed versions of the main lecture notes can be purchased from the Faculty of Science Student Resource Centre.

## Student Feedback

During the course Class Representatives in each class can take feedback to the staff responsible for the course and staff-student consultative committees.

At the end of the course students will be invited to give feedback on the course and teaching through a tool called SET or Qualtrics. The lecturers and course co-ordinators will consider all feedback.

Your feedback helps to improve the course and its delivery for all students.

## Digital Resources

Course materials are made available in a learning and collaboration tool called Canvas which also includes reading lists and lecture recordings (where available).

Please remember that the recording of any class on a personal device requires the permission of the instructor.

## Academic Integrity

The University of Auckland will not tolerate cheating, or assisting others to cheat, and views cheating in coursework as a serious academic offence. The work that a student submits for grading must be the student's own work, reflecting their learning. Where work from other sources is used, it must be properly acknowledged and referenced. This requirement also applies to sources on the internet. A student's assessed work may be reviewed against online source material using computerised detection mechanisms.

## Copyright

The content and delivery of content in this course are protected by copyright. Material belonging to others may have been used in this course and copied by and solely for the educational purposes of the University under license.

You may copy the course content for the purposes of private study or research, but you may not upload onto any third party site, make a further copy or sell, alter or further reproduce or distribute any part of the course content to another person.

## Inclusive Learning

All students are asked to discuss any impairment related requirements privately, face to face and/or in written form with the course coordinator, lecturer or tutor.

Student Disability Services also provides support for students with a wide range of impairments, both visible and invisible, to succeed and excel at the University. For more information and contact details, please visit the [Student Disability Services' website](http://disability.auckland.ac.nz) <http://disability.auckland.ac.nz>

### Special Circumstances

If your ability to complete assessed coursework is affected by illness or other personal circumstances outside of your control, contact a member of teaching staff as soon as possible before the assessment is due.

If your personal circumstances significantly affect your performance, or preparation, for an exam or eligible written test, refer to the University's [aegrotat or compassionate consideration page](https://www.auckland.ac.nz/en/students/academic-information/exams-and-final-results/during-exams/aegrotat-and-compassionate-consideration.html) <https://www.auckland.ac.nz/en/students/academic-information/exams-and-final-results/during-exams/aegrotat-and-compassionate-consideration.html>.

This should be done as soon as possible and no later than seven days after the affected test or exam date.

### Learning Continuity

In the event of an unexpected disruption we undertake to maintain the continuity and standard of teaching and learning in all your courses throughout the year. If there are unexpected disruptions the University has contingency plans to ensure that access to your course continues and your assessment is fair, and not compromised. Some adjustments may need to be made in emergencies. You will be kept fully informed by your course co-ordinator, and if disruption occurs you should refer to the University Website for information about how to proceed.

Level 1: Delivered normally as specified in delivery mode

Level 2: You will not be required to attend in person. All teaching and assessment will have a remote option.

Level 3 / 4: All teaching activities and assessments are delivered remotely

### Student Charter and Responsibilities

The Student Charter assumes and acknowledges that students are active participants in the learning process and that they have responsibilities to the institution and the international community of scholars. The University expects that students will act at all times in a way that demonstrates respect for the rights of other students and staff so that the learning environment is both safe and productive. For further information visit [Student Charter](https://www.auckland.ac.nz/en/students/forms-policies-and-guidelines/student-policies-and-guidelines/student-charter.html) <https://www.auckland.ac.nz/en/students/forms-policies-and-guidelines/student-policies-and-guidelines/student-charter.html>.

### Disclaimer

Elements of this outline may be subject to change. The latest information about the course will be available for enrolled students in Canvas.

In this course you may be asked to submit your coursework assessments digitally. The University reserves the right to conduct scheduled tests and examinations for this course online or through the use of computers or other electronic devices. Where tests or examinations are conducted online remote invigilation arrangements may be used. The final decision on the completion mode for a test or examination, and remote invigilation arrangements where applicable, will be advised to students at least 10 days prior to the scheduled date of the assessment, or in the case of an examination when the examination timetable is published.