

BIOL209 – Biological Data Analysis

0.125 EFTS, 15 Points.

First Semester

***Whakamahuki* | Description**

Introductory statistics with specific examples for biologists. This course is strongly recommended for all students in BIOL.

***Whāinga Mahi* | Goals of the Course**

The overall aim of BIOL209 is to introduce you to presentation of results, statistical analyses and interpretation of experimental data, as they apply to biological research. The biological focus applies both to the choice of relevant methods and the specific examples discussed. The examples will cover a wide range of biology, from biochemistry to ecology, so that the course is applicable across all biological disciplines. One aim of the course is to prepare students for undergraduate analytical exercises, postgraduate research and jobs in research organisations. BIOL209 progresses from concepts of central tendency, probability distributions, then on to hypothesis testing of various types.

***Me whakaoti i mua* | Pre-requisites**

STAT 101 or 15 points of 100-level MATH

Relationship to other courses

BIOL209 will be of considerable value in analytical requirements for all other science courses in which data are collected. BIOL209 is also a pre-requisite for BIOL309 (Experimental Design and Data Analysis for Biologists), which is essential for students advancing to postgraduate study in biological sciences.

Course contact: biology209@canterbury.ac.nz

***Kairuruku akoranga* | Course coordinator**

Dr Sarah Flanagan, Julius von Haast 237

***Hua Akoranga me ngā Aromatawai* | Intended Learning Outcomes and Assessment**

As a student in this course, I will develop the ability to:

Learning Outcome Number 1 (LO1)

A clear understanding of basic statistical principles (*assessment: lab quizzes, midterm test, final exam*)

Related Graduate Attributes and Kaupapa: Critically competent in the core academic discipline, Employable, innovative and enterprising

Learning Outcome Number 2 (LO2)

Proficiency in the transcription and manipulation of data (*assessment: lab quizzes, midterm test, final exam*)

Related Graduate Attributes and Kaupapa: Critically competent in the core academic discipline, Employable, innovative and enterprising

Learning Outcome Number 3 (LO3)

A basic understanding of a wide range of parametric and non-parametric statistical tests (*assessment: lab quizzes, final exam*)

Related Graduate Attributes and Kaupapa: Critically competent in the core academic discipline, Biculturally Competent and Confident (kaupapa 1), Employable, innovative and enterprising

Learning Outcome Number 4 (LO4)

Proficiency in the analysis of a wide range of biological data, including the ability to place the data in an appropriate context (*assessment: lab quizzes, midterm test, final exam*)

Related Graduate Attributes and Kaupapa: Critically competent in the core academic discipline, Employable, innovative and enterprising, Biculturally Competent and Confident (kaupapa 1, 3, 5)

Learning Outcome Number 5 (LO5)

Ability to use R to process and analyze data (*assessment: lab quizzes, final exam*)

Related Graduate Attributes and Kaupapa: Critically competent in the core academic discipline, Employable, innovative and enterprising

***Pūkenga ngaio* | Transferable skills**

As a student in this course, I will develop the following skills:

- Understand statistical results presented in research papers and technical reports. The ability to critically evaluate and interpret statistical information is not only essential in higher-level courses but is a part of everyday life. (*assessment: lab quizzes, final exam*)
Related Graduate Attributes and Kaupapa: Critically competent in the core academic discipline, Employable, innovative and enterprising
- Ability to apply basic concepts in exploratory data analysis. This ability is important for distinguishing between different types of data, methods of summarising data both graphically and through summary statistics. (*assessment: lab quizzes, midterm test, final exam*)
Related Graduate Attributes and Kaupapa: Critically competent in the core academic discipline, Employable, innovative and enterprising
- Knowledge of the basics of collecting data and generating descriptive statistics. This skill is essential for all higher-level courses that include laboratory or field based research activities. (*assessment: lab quizzes, midterm test, final exam*)
Related Graduate Attributes and Kaupapa: Critically competent in the core academic discipline
- Ability to apply the appropriate test and draw appropriate conclusions from the test output. This ability is important aspect of research and its application. (*assessment: lab quizzes, final exam*)
Related Graduate Attributes and Kaupapa: Critically competent in the core academic discipline, Employable, innovative and enterprising
- Interpretation and communication skills. The ability to describe what the results mean in the context of the problem and being able to explain the results to someone else is essential for any professional career. (*assessment: lab quizzes, final exam*)
Related Graduate Attributes and Kaupapa: Critically competent in the core academic discipline, Employable, innovative and enterprising

***Aromatawai* | Assessment:**

Core assessment – must pass each component

20% Lab Quizzes (one per week, 2% each)

30% Midterm Test (on LEARN during week 4)

50% final exam (end of semester 1)

To pass the course, you must score above 40% in each category above and earn 50% or higher overall. In addition, **you must score >70% on the Core Essentials Test** (due at the end of Term 1).

Weekly Quizzes: The quizzes will be open for one week, and will test both lecture and lab material from the week. You will need to complete these on LEARN. Each week is worth <2%, and we will drop your lowest mark (count the best 11 of the 12 assessments).

Core Essentials Test: Students must score >70% on this test to pass the course, but the score will not contribute to the final grade. You will have unlimited opportunities to take the test, and it must be completed by the end of Term 1. You are also required attempt it at least once before they can take their first graded quiz.

Midterm Test: This test will be administered on LEARN and will consist primarily of multiple-choice questions. It will cover the first two to three weeks of material, focusing on summarizing various types of probability distributions.

Final exam: The final exam is cumulative, therefore the material in the first 3 weeks will be assessed in both the midterm and the final. Unless stated otherwise closer to exam time, you can expect it to be comprised of a combination of multiple choice and short answer questions.

A major challenge of BIOL209 for some students is keeping up with each topic without falling behind. The topics generally build on each other throughout the course and it can be difficult for students to catch up if they fall too far behind. This is one reason that we have both the weekly lab quizzes and the midterm test, to give you continual feedback on how you are doing. If you have problems with concepts, please post them on the LEARN forum and/or discuss them with lecturers or lab demonstrators as soon as possible. Don't let your problems compound by falling even further behind in the course. Check the LEARN page for optional problem sets and extra assistance.

See below for departmental policies on late work, illness, and work that exceeds the length limits. Note that Biology policy says that to pass the course you need at least a 40% average across the interim work (lab assessments) and at least a 40% average in the final exam, AND at least 50% overall (see departmental policies below for more detail).

***Tuhinga* | Textbook**

The recommended textbook is:

Whitlock, M. & Schluter, D. (2020). *The Analysis of Biological Data*. 3rd edition. Macmillan.

This is available from the University Bookshop, Amazon, FishPond, Booktopia, and other book sellers. It can also be accessed via the library on either a 3-day or 3-hour loan.

We think this is the best statistics textbook available for biology students at a 200-level, and it has additional highly valuable resources including practice problems with answers. So, if it is within your means, we really do recommend obtaining a copy of this book for your personal library, even though this is only the recommended book, as you will find it useful when you return to these concepts in future coursework.

***Wā hui* | Course Contact Hours**

The course runs through the first semester (Terms 1 and 2) and consists of lectures, computer labs, and optional tutorials. **Check the UC timetable for time and room allocations and check LEARN for the order of topics and the instructors** as these may change before term starts.

Lectures: There are two lectures per week [LecA and LecB in Timetable], and we highly recommend that you attend these so that you have the opportunity to ask questions immediately as they arise. These will be recorded and made available on echo360.

Labs: There is one lab per week. In weeks 1 and 2, we will have shorter 1-hour labs so that we can have smaller streams and facilitate introducing the R statistical programming language [called ComB in Timetable]. In the subsequent weeks, each lab will last for 2 hours [called ComA in Timetable]. All labs will be led by Assoc. Prof. Daniel Stouffer unless noted otherwise. Lab sessions are not recorded.

Optional tutorials: These tutorials [TutA in Timetable] are optional drop-in question-and-answer sessions hosted by the demonstrators for the course. These will not be recorded.

In addition to these contact hours, we expect students to spend approximately 1.5 hours on the quizzes and an additional 2 - 4 hours on practice problems, reading, and studying for BIOL209 each week.

Midterm: The midterm test is scheduled in your Timetable and will take place during week 4 of the semester.

Feedback from previous Course Surveys

The last course survey was given in 2023. Students found the assessments to be appropriate for the course, but provided mixed feedback about the workload. The greatest area for improvement falls under the organization of the course.

To improve the course, we are taking a research-based approach to understand how teaching methodologies and course structure influence student motivation, grit, and learning. To that end, very few changes have been made to the course for 2024, but students have the opportunity to be involved in the research project's surveys and focus groups (more information to be given in the class). The information from this qualitative research will inform major changes to the course for 2025.

RULES, REGULATIONS, AND WHAT TO DO WHEN THINGS GO WRONG

[updated January 2023]

If in doubt: ASK! The course coordinator is happy to answer questions. All staff involved in the course are available for advice on specific issues.

What do I do if I have to miss a test/exam or if my performance was impaired?

In Biological Sciences, we require a satisfactory level of achievement in both the theoretical aspects of the discipline and in practical activities. **This means you must attend all class activities (labs, tutorials, fieldtrips)** and submit all items of assessment unless you have a very good reason not to (e.g. medical reasons) and if this has been approved by your course coordinator.

If you feel that **illness, injury, bereavement or other extenuating circumstances beyond your control** prevented you from completing a **test/exam** worth 10% or more of the total course assessment, or if these circumstances affected your performance in such assessments, you should apply for Special Consideration. Applications for Special Consideration should be submitted via the Special Consideration website <http://www.canterbury.ac.nz/study/special-consideration/> *within five working days* of the assessment or its due date. You should also notify the course coordinator. If you apply for Special Consideration because of medical reasons, you should visit a doctor within a reasonable timeframe (application form available on the website above or from the Student Health Centre).

The Special Consideration provisions are intended to assist students who have covered the work of a course but have been prevented by illness or other critical circumstances from demonstrating their mastery of the material or skills at the time of a test/exam – **they do not excuse you from doing the test/exam** within a reasonable time agreed with the course coordinator.

What do I do if I have to miss a quiz or assignment or if I need an extension?

You cannot apply for Special Consideration if you miss an assessment that is not a test/exam, such as a quiz, lab report, essay, literature review or other assignment, or if the test/exam is worth less than 10% or more of the total course assessment. If this happens or if you need an extension because of **illness, injury, bereavement or other extenuating circumstances beyond your control**, please contact the course coordinator and arrange an alternate activity and/or submission date. You should also do this if you have to miss a laboratory, tutorial or field trip.

What are other valid reasons to miss an assessment or mandatory course activity?

The Special Considerations policy (<https://www.canterbury.ac.nz/about/governance/ucpolicy/student/special-consideration-procedures-and-guidelines/>) outlines only a few kinds of activities that UC considers valid reasons for missing an assessment or mandatory course activity other than those outlined above. These include **involvement in international or national representative sport or cultural groups**. Holiday trips, birthday parties, weddings, work-related commitments etc. are not given special status in this University policy. Please contact your course coordinator to ask for an alternate activity and/or submission date if you are eligible.

Special Consideration for late discontinuation of a course

Students prevented by **extenuating circumstances** from completing the course after the final date for withdrawing, may apply for Special Consideration for late discontinuation of the course. Applications must be submitted via <http://www.canterbury.ac.nz/study/special-consideration/> no later than five working days after the examination period has finished.

Academic Integrity

It is the responsibility of each student to be familiar with the definitions, policies and procedures concerning academic misconduct/dishonest behaviour. Instances of academic misconduct will be dealt with in a serious and appropriate manner. Students should refer to: <https://www.canterbury.ac.nz/about/ako/academic-quality/academic-integrity/>

Plagiarism

It is essential that you are aware that plagiarism is considered a very serious offence by the academic community, the University and the School of Biological Sciences. Plagiarism is defined as taking content from another work or author and presenting it, without attribution, as if it is your own work. Content here includes text (sentences or major parts of sentences), display items (graphs and tables), and overall structure (the detailed sequence of ideas). Plagiarism includes:

- re-use of previous assignments (even if each individual sentence has been rephrased to say the same thing in different words, if the overall structure is re-used).
- copying of another student's work (with or without their consent).
- the unreferenced use of published material or material from the internet, e.g. cutting and pasting of paragraphs or pages into an essay.

For most pieces of in-term assessment you will be given information concerning the use of direct and indirect quotes from previously published work. If you have any doubt about the appropriate use of published material, please speak with an academic staff member. If you are unsure what plagiarism is, seek advice.

It is a School policy that courses will likely that you submit work electronically for subsequent analysis of originality using *Turnitin*. Students agree that by taking courses in BIOL, assessments may be submitted to Turnitin.com for textual similarity review. All submitted papers will be included as source documents in the Turnitin.com reference database

solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Terms and Conditions of Use as posted on the Turnitin.com site.

Where do I hand in assignments and then collect them once marked?

All assignments should be submitted as directed by the course coordinator. Typically, this will be electronically via Learn for on-line grading and for analysis in *Turnitin*. If a hard copy is requested, assignments should be placed in the designated collection boxes in the foyer of the 2nd floor of the School of Biological Sciences (Julius von Haast building, at the top of the stairs). All assignments must be accompanied by a cover sheet signed by you stating that the submitted work is not plagiarised. Cover sheets are available on top of the collection boxes, or you can download one from the Biology website (<http://www.canterbury.ac.nz/media/documents/science-documents/assignment-coversheet.pdf>).

Marked assignments will be returned through Learn or, if in hard copy, can be collected from the School of Biological Sciences reception, unless directed otherwise by the course coordinator. Teaching staff will endeavour to return work as soon as possible, and should contact you if there are likely to be any delays that will prevent return within the maximum 4-week timeframe.

What if I can't get it finished in time?

Reports and assignments should be handed in on time. Extensions may be granted if you have a valid reason (see above). **If you require an extension, you should request one from the course coordinator** (or the lecturer responsible for marking the work), with as much notice as possible. Please do this **BEFORE** the deadline for the assignment. **If you have been given an extension and you have been asked to submit a hard-copy of your work, you should hand the work DIRECTLY to the course coordinator** (do not put it in the drop box as it may not be cleared after the due date).

If an extension has not been granted:

- work handed in within 1 hour of the deadline: penalty of up to 5 percentage points of the mark for the assignment (e.g., a mark of 75% might be reduced to 70%).
- work handed in 1 – 24 hours after the deadline: penalty of 10 percentage points of the mark for the assignment (e.g., a mark of 75% is reduced to 65%).
- work handed in 1 – 7 days after the deadline: penalty of 15 percentage points of the mark for the assignment (e.g., a mark of 75% is reduced to 60%).
- work handed in more than 7 days after the deadline will not be marked or earn credit.

What if I have written more than the word or page limit?

If there is a word limit on an assignment, it is usually there to stop you doing too much work and to encourage you to write succinctly. You can be up to 10% over without too much worry, but if the length increases beyond that your mark may suffer due to failure to follow the requirements. If you find yourself way over the word limit talk to the lecturer concerned about how to get your assignment to an acceptable length. Unless specifically advised that there is flexibility, you must adhere to the word limit indicated.

What if I fail part of the course?

In Biological Sciences, we require a satisfactory level of achievement in both the theoretical aspects of the discipline and in practical activities. This means you must attend all class activities and submit all items of assessment unless you have a very good reason not to (e.g. medical reasons). **A student must attain an average score of at least 40% for in-course assessments (e.g. assignments, reports, quizzes) and an average score of at least 40% in the exam and/or tests, AND score at least 50% overall for the course, to be awarded a passing grade. See the course outlines for clarification of the assessment items included in each category and ask the coordinator if you are still unsure.**

What's the best way to give feedback?

We welcome constructive feedback at all times – help us to make this a valuable course for you. We endeavour to remain approachable at all times. If you would rather give feedback anonymously, please use the online course survey or talk to lab demonstrators, or your class rep (who will all report back to the staff-student liaison committee that includes a representative from each of the undergraduate classes). Class representatives will be selected from each class at the start of course.

What's the best way to complain?

If you feel you have not been fairly treated during this course, please raise the issue with the lecturer or course coordinator in the first instance. Other avenues include your class rep., who can raise issues anonymously, or the UCSA education coordinator.

Grading

A+	90% or above
A	85 – 90
A-	80 – 84
B+	75 – 79
B	70 – 74
B-	65 – 69
C+	60 – 64
C	55 – 59

C- 50 – 54

A restricted pass (R) **may** be awarded to those who are close to a pass (i.e. an overall score of 48-49.9%) AND who have achieved at least a 40% overall score in both in-course assessment and tests/exams. If an R grade is awarded you gain credit for the course but **cannot continue into papers that require this course as a pre-requisite**. NB. The R grade is only available at 100 and 200 level - it cannot be awarded for third year papers.

Failing grades: D 40-49 E 0–39