School of Biological Sciences
Te Kura Pūtaiao Koiora

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Course outline | Ngā Whakamārama 2022

BIOL334-22S2 (C) Semester 2, 2022
Evolutionary Genetics and Genomics
0.125 EFTS 15 Points
Semester 2
18 Jul 2021 – 21 Oct 2021

Course description | Whakamahuki

BIOL334 is an advanced course that builds on the conceptual frameworks developed in the pre-requisite course BIOL271. It provides in-depth coverage across the breadth of evolutionary genetics and genomics with an emphasis on conservation genetics/genomics, epigenetics, evolution and development (evo-devo) and genomic interactions with the environment.

Course Goals
To provide students with an advanced understanding of evolutionary genetics and genomics including the genetic/genomic consequences of small population size, and mechanisms of evolution from a genomics perspective. This course is intended for anyone with an interest in both fundamental and applied research, or who wishes to gain bioinformatic experience working with large genetic and genomic data sets. Te Tiriti o Waitangi (The Treaty of Waitangi) is embedded in the course, and it is also particularly well suited for anyone who plans to pursue a career in genetics or genomics that is responsive to the needs and aspirations of Indigenous communities.

Teaching Staff
A/Prof Tammy Steeves, Julius von Haast Room 533, 369 5378, tammy.steeves@canterbury.ac.nz
Dr Axel Moehrenschlager, Visiting Erskine Fellow, AxelM@calgaryzoo.com
Dr Amy Osborne, Julius von Haast Room 522, 369 2532, amy.osborne@canterbury.ac.nz

Timetable – *see LEARN for details*
Lectures – 2 per week: Students are expected to prepare in advance for lectures.
Tutorials – 6 tutorials: Tutorials held in two blocks during the last three weeks of term 3 and term 4, respectively.
Check 'My Timetable' on the UC website for venues and any last-minute changes to times.

Assessment | Aromatawai – *see LEARN for details*

Pre-lecture online quizzes (Conservation genomics)	5%
Tutorial assessment (Conservation genomics)	15%
Midcourse test (Conservation genomics, date TBC)	30%
Pre-lecture online quizzes (Genomic mechanisms)	5%
Tutorial assessment (Genomic mechanisms)	15%
Final exam (Genomic mechanisms)	30%
Total	**100%**

*To gain a pass students much achieve a mark of 50% overall **plus** achieve an average score of at least 40% for tutorial assessments **and** an average score of at least 40% for the midcourse test/final exam.*

Course content
The following is a brief outline of the topics that will be covered by the course, and the lecturers involved in each of the sections. See LEARN for details.

Conservation genomics, *Tammy Steeves and Axel Moehrenschlager – 12 lectures (term 3)*
These lectures and tutorials will focus on the use of genetic/genomic data to inform the survival and recovery of threatened species with an emphasis on conservation translocations. Topics will include the difference between conservation genetics and conservation genomics, including the genetic and genomic consequences of small population size, intra- and interspecific hybridization and the resolution of taxonomic uncertainties. We will also explore cultural considerations associated with the generation, storage, access and use of genetic/genomic data for research on threatened taonga (treasured) species in Aotearoa New Zealand.

Genomic mechanisms, *Amy Osborne – 12 lectures (term 4)*
These lectures and tutorials will focus on the genomic mechanisms that may drive evolutionary processes. Topics will include epigenetics (methylation and gene expression) phenotypic plasticity at the molecular level, the predictive adaptive response hypothesis, the developmental origins of health and disease, the interaction between the environment and the genome, 3D genome structure and organisation, and genome regulation. We will specifically address different genomic processes and genome outputs, and how differences within these might drive evolution.

Lecture timetable:

Lecture 1	International, national, local context for genetic and genomic research involving culturally significant species	TS
Lecture 2	International, national, local context for genetic and genomic research involving culturally significant species	TS
Lecture 3	Introduction to conservation translocations	TS/AM
Lecture 4	Re-imagining conservation translocations	TS/AM
Lecture 5	Genetics/genomics of small populations	TS
Lecture 6	Genetics/genomics of small populations	TS/AM
Lecture 7	Intraspecific hybridisation	TS
Lecture 8	Intraspecific hybridisation	TS/AM
Lecture 9	Interspecific hybridisation	TS
Lecture 10	Interspecific hybridisation	TS/AM
Lecture 11	Taxonomic uncertainties	TS
Lecture 12	Taxonomic uncertainties	TS/AM

Lecture 13	Evolution and development	AO
Lecture 14	Evolution of novelty	AO
Lecture 15	PBL	AO
Lecture 16	Epigenetics	AO
Lecture 17	Developmental Origins of Health and Disease	AO
Lecture 18	PBL	AO
Lecture 19	Transgenerational epigenetic inheritance	AO
Lecture 20	Evolutionary ecology	AO
Lecture 21	PBL	AO
Lecture 22	3D chromosome organisation	AO
Lecture 23	PBL	AO
Lecture 24	Refresher session	AO

Graduate Profile | Āhuatanga Taura

This course will provide students with an opportunity to develop these UC Graduate Attributes (GP) and Kaupapa (K) (www.canterbury.ac.nz/study/graduate- profile/students/what-are-the-graduate-attributes/):

- GP1 Critically competent in a core academic discipline.
- GP2 Employable, innovative and enterprising.
- GP3 Biculturally competent and confident: K1 A process of self-reflection on the nature of 'knowledge' and 'norms' K3 Traditional and contemporary realities of Māori society e.g. tikanga and kawa, te reo Māori K7 Application of bicultural competence and confidence in a chosen discipline and career
- GP5 Globally aware

Intended Learning Outcomes | Hua Akoranga and Associated Assessment | Aromatawai

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

- Explain the difference between conservation genetics and conservation genomics (*assessment task: pre-lecture quizzes and midcourse test*).
  Related graduate attributes: GP1, GP3, GP5
- Explain how genomic data may better inform the conservation management of threatened species *(assessment tasks: pre-lecture quizzes and midcourse test).*
  Related graduate attributes: GP1, GP2, GP3, GP5

- Explain how embedding kaupapa Māori principles contextualises genomic research of threatened taonga (treasured) species in Aotearoa New Zealand (*assessment tasks: conservation genomics tutorials and midcourse test*).
  Related graduate attributes: GP1, GP2, GP3, GP5
- Explain how the environment can interact with the genome to alter genome output and why might these processes influence evolution (*assessment tasks: pre-lecture quizzes and final exam*).
  Related graduate attributes: GP1, GP2, GP5
- Explain how the genome is organised at the 3D level, and how genome interactions can contribute to genomic changes that may influence evolution (*assessment tasks: pre-lecture quizzes and final exam*).
  Analyse differential gene expression in response to environmental change (*assessment tasks: genomic mechanisms tutorials and final exam*).
  Related graduate attributes: GP1, GP2, GP5

Transferable Skills / Pūkenga Ngaio

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

- *Synthesising information.* In everyday life and in many job situations you will be required to read information from different sources, construct your own understanding and shape your own viewpoint. *This will developed during discussions of recent research papers during lectures, including the discussion of the essential elements of research papers during problem-based lectures and tutorials.*
  Related graduate attributes: GP1, GP2, GP3, GP5
- *Building bicultural competence and confidence*. Important for research in Aotearoa New Zealand, as well as in a number of private-sector and public-sector organisations. *This skill will be developed during discussions of Te Tiriti o Waitangi (The Treaty of Waitangi) in the context of genomics research of taonga (treasured) species during lectures, including problem-based lectures, and tutorials.*
  Related graduate attributes: GP1, GP2, GP3, GP5
- *Analysing and interpreting data.* Important for research, as well as in a number of private-sector and public-sector organisations. *This skill will be developed when we assist you to analyse and interpret genetic and genomic data in tutorials.*
  Related graduate attributes: GP1, GP2, GP3, GP5

Feedback from Course Surveys

Student ratings:	**2017**	**2014**
1. Course materials helped me to understand what was required to succeed	**4.3**	**n/a**
2. Course organisation helped me learn (2017)/Course well organised (2014)	**4.4**	**4.7**
3. Course workload appropriate	**4.4**	**4.7**
4. Course assessments appropriate	**4.5**	**n/a**
5. Where I sought feedback, I found it helpful	**4.2**	**n/a**

The following questions were raised in online course surveys completed by previous students. Responses were collated by the course coordinator and common responses scored.

Which aspects of this course were most positive?

- Super Enjoyable Course. Had so much fun this semester in the course.
- The most helpful aspects were the well organised full content uploaded to learn – thus if I was unable to attend a lecture I was able to still listen to the lectures, view the powerpoint slides, and access the articles etc. recommended for further reading very easily.
- Pre lecture quizzes.
- Lectures and tutorials.
- Feedback provided from the pre lecture quizzes and from the tutorial work.

- All the practice questions.
- Tutorials and review lectures to go over calculations and practice exam questions.

How could this course be enhanced to assist your learning?

- The course was so well organised and delivered, it doesn't need any changes. Thanks ☺
- Addition of another form of assessment, adding a midterm assessment. **We added a midcourse test for assess term 3 content.**

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

[updated 3 April 2020]

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

What do I do if I have to miss something or if my performance was impaired?

If you feel that **illness, injury, bereavement or other extenuating circumstances beyond your control** prevented you from completing an item of assessment 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 will also need to 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 assessment – they do not excuse you from doing the assessment within a reasonable time agreed with the course coordinator. You should expect to be required to submit additional work if you miss a major assignment (e.g. a field trip for which a major write-up is required).

You should also apply for Special Consideration if you are not be able to complete an assessment or attend a field trip because of **involvement in international or national representative sport or cultural groups**. Please review the Special Considerations policy, because very few kinds of activities will be eligible for such consideration (e.g. holiday trips, birthday parties etc. are not given special status in the University policy).

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.

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 may request 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 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), unless directed otherwise by the course coordinator. 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). In addition, you may also be asked to submit your work electronically (via Learn) for analysis in *Turnitin*.

Marked assignments 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. **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 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.

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) 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