

School of Biological Sciences / Te Hiranga Ahumoana,
Hauropi Moana

Course Information / *Ngā Whakamārama* - 2024

BIOL352 [updated on 14 February, 2024]

Plant Development & Biotechnology

0.125 EFTS 15 Points

Semester 1

Description / *Whakamahuki*

In this course, we will explore the fascinating links between plant development and biotechnological innovations. Initially, we delve into plant tissue culture, uncovering the science behind cultured plant cells and their role in agricultural biotech, plant breeding, and genetic modification. The next phase brings you closer to the world of plant engineering, showcasing real-world examples and the impact of public opinion on genetic engineering.

Beyond lectures, you will dive hands-on into a plant tissue culture project and a computer tutorial, gaining early exposure to Geneious software for plant-specific cloning.

Additionally, two assessments will introduce students into the original research literature on plant tissue culture and plant engineering, respectively.

Prerequisites

[BIOL254](#) or [BIOL253](#) or [BIOL231/BCHM202](#)

Goal of the Course

To introduce the principles and applications of plant tissue culture research and to develop an understanding of the biology of cultured plant cells; to introduce the principles of genetic engineering and gene editing of plants and to examine issues associated with its potential use including metabolic engineering and its application to horticulture and agriculture; and to get an introduction to selected skills used in plant biotechnology research.

Course Coordinator / *Kairuruku Akoranga*

Dr David Leung

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Teachers / *Pūkenga*

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Intended Learning Outcomes (*Hua Akoranga*) and Associated Assessment (*Aromatawai*)

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

1. Access and utilise the scientific literature on plant biotechnology (plant tissue culture and genetic engineering/gene editing of plants) [Graduate Attribute 1: Mastery of discipline]: (*assessment tasks: library-based research activities*)
2. Synthesise primary scientific literature to provide background and context for understanding and interpreting experimental data (Graduate Attribute 1: Mastery of discipline and Graduate Attribute 2: Employable, innovative and enterprising): (*assessment task: lab-based research project*)
3. Connect knowledge of biotechnology and use of New Zealand native plants (Graduate Attribute 4: Biculturally competent and confident; Kaupapa 1, 2, 3 and 7): (*assessment task: library-based research activities*)
4. Get familiar with molecular cloning concepts and techniques (Graduate Attribute 1: Mastery of discipline): (*assessment task: computer-based lab activity*)
5. Have a better understanding of the concepts and associated research progress from selected advanced topics in plant development and their connections to biotechnology (Graduate Attribute 1: Mastery of discipline): (*assessment task: library-based research activities*)

Transferable Skills / *Pūkenga Ngaio*

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

1. Synthesising information. In many science jobs it is necessary to read the literature on a topic and write a literature review. *We will discuss literature searching and the essential elements of a sound literature review.* (Graduate attribute 2: Employable, innovative and enterprising)
2. Designing experiments, collecting and analysing data: This is an important skill required for research in governmental and non-governmental organisations. *An integral part of the lab sessions is to facilitate the development of these skills.* (Graduate attribute 2: Employable, innovative and enterprising)
3. Reporting findings: Clear communication skills are essential for most professional careers. Often it may be also necessary to make a short oral presentation on the findings from the literature review. *We will discuss the elements of effective presentations of findings from experimental work and library-based research.* (Graduate attribute 2): Employable, innovative and enterprising)

Outline of Lectures

Teachers:

Dr David Leung (DL)

Dr Claudia Meisrimler (CM)

| Number of Lectures | Topics |
|--------------------|---|
| Six | Introduction to Agricultural Biotechnology: Embryo rescue; plant tissue culture including nodal explant culture, micropropagation, organogenesis and embryogenesis; meristem culture and production of virus-free plants; plant breeding applications of somaclonal variation and somatic hybridisation; mutagenesis for plant breeding (DL) |
| Four | Introduction to Genetic engineering of plants: technical aspects and biology of plant transformation. <i>Agrobacterium</i> and “biolistics”; selectable marker and reporter genes; herbicide, insect and virus tolerant plants (DL) |
| Three | PCR, Plasmids and cloning: the molecular basics of plant engineering (CM) |
| Nine | Secondary metabolism and plant engineering – application and research (CM) |
| Two | Oral presentations by students |

Library-based research & Laboratory work

More details will be provided on the course LEARN site.

In Term 1, DL will oversee the first three lab sessions (starting from the first week of the course) for students to design and carry out plant tissue culture experiments to investigate the relative importance of auxin and cytokinin in regulation of plant morphogenesis. These sessions will take about 6 hours and comprise a mixture of classes as scheduled on CIS and use of specialist equipment by booking only at outside the scheduled lab times on CIS. To prepare for the first lab, read the material in the section Plant tissue culture lab on the course LEARN site before coming to the lab.

In Term 2, CM will oversee the computer lab on molecular cloning of genes.

Please consult the web pages of the School of Biological Sciences regarding the Health and Safety policies applicable to working in a laboratory.

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/) (<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