

Course outline | Ngā Whakamārama 2024

BIOL213-24S2 Semester 2, 2024

***Mātai koiora moroiti* | Microbiology**

0.125 EFTS, 15 Points

Jul 2024 - Nov 2024

***Whakamahuki* | Course description**

***Mātai koiora moroiti* | Microbiology**

Is there anything that microorganisms cannot do?

Microorganisms are the foundation of all of Earth's ecosystems. They mediate innumerable interactions with humans, plants, animals, and each other. They can be found in the deepest subsurface sediments to boiling hot springs to the tips of the atmosphere, and we make use of them from everything from food production to drug production. This course provides focussed introductory learning on microorganisms, microbial activity and the roles microorganisms play from the molecular to the global scale. You will learn about microbial genetics, microbial ecology, basic microbial metabolism, host-microbe interactions and global microbe-ecosystem interactions. Topics covered include the gut microbiome, fermentation & food microbiology, geomicrobiology and climate, plant-microbial interactions including disease and biocontrol, viruses and bacteriophage, microbial coexistence and competition, and the microbiology of extreme environments. The laboratory component of this course has an emphasis on mastering practical microbiology skills such as aseptic technique, experimental design and planning, and methods for controlling microbial growth. The course also includes a field trip as part of the laboratory schedule.

Who is this course intended for?

BIOL213 is targeted at students with an interest in microbiology, microbial ecology, biodiversity and biotechnology using microorganisms. It provides the microbiological fundamentals for applied microbiology and fundamental microbiological research. Most importantly, the course is designed to build both research and employment skills. The learning and laboratories skills in this course are essential for third year Advanced Microbiology (BIOL313), and important for third year molecular biology and biochemistry courses.

***Āhuatanga Taura* | Graduate Profile**

This course will provide students with an opportunity to develop these UC Graduate Attributes (GP) and Kaupapa (K) (<https://www.canterbury.ac.nz/study/study-support-info/study-related-topics/graduate-profile>):

- **GP1:** Employable, innovative and enterprising. Transferable skills such as communication, analytical, critical thinking, and problem-solving skills are sought-after by employers.
- **GP2:** Biculturally competent and confident.
- **GP4:** Globally aware.
- **K7:** Application of bicultural competence and confidence in a chosen discipline and career

Hua Akoranga e Aromatawai |

Intended Learning Outcomes and Associated Assessment

At the end of the course, students will:

- Have a broad understanding and knowledge of microbiology in ecosystems, and why microbiology is important at all scales (*assessment tasks: final exam, laboratory pre- and post-worksheets, midsemester test*) (**GP1, GP2, GP4**)
- Master methods for studying microorganisms safely (*assessment task: laboratory worksheets*) (**GP1**).
- Understand and interpret experimental evidence, and how to develop a hypothesis (*assessment task: laboratory worksheets*) (**GP1**).
- Understand key methods of handling and using microorganisms in the laboratory (*assessment tasks: final exam, laboratory pre- and post-worksheets, midsemester test*) (**GP1**)
- Be competent in experimental design and the use of mathematics and chemistry in microbiology (*assessment tasks: laboratory pre- and post-worksheets*) (**GP1**).
- Be able to isolate and subculture a bacterial strain (*assessment task: lab assessment*) (**GP1**).
- Have core microbiology knowledge (**GP1, GP2, GP4 (K7)**). These will include:
 - fundamentals of microbiology
 - microbial genetics
 - microbial ecology
 - microbial metabolism and growth
 - microbial detection and control
 - human microbiome
 - microorganism-host interactions and disease
 - geomicrobiological ecosystems,
 - climate and biogeochemical cycles

Pūkenga Ngaio | Transferable Skills

The following skills are developed in this course:

- Core microbiology wet-laboratory skills (Important for careers that include lab work):
 - Aseptic techniques
 - Experimental design
- Experimental data analysis and interpretation
 - Work safely in a molecular lab and comply with PC2 containment regulation (Important for careers that include lab work).
 - Independent and self-motivated learning. A life-skill that is important in any career.
 - Finding, understanding, and using information in literature and on the internet. These are very general skills that are essential in many careers.
- Written and oral communication. Many employers require employees to have good communication skills.

Prerequisites:

- Prerequisite courses: BIOL111 (BCHM111) or BIOL113.
- Recommended courses: BIOL231 (BCHM202), CHEM112 and CHEM114.

In order to be successful at this course, you are expected to have a competent understanding of basic microbiology and central dogma learnt from the above courses.

The Learn pages for this course contain essential material, assignments and instructions that are essential for completing the course.

Lectures:

Check university website for times and rooms in case of changes.

Syllabus:

Basic microbiology:

Fundamentals of microbiology

Basic microbial metabolism:

Bacterial growth

Microbial control

Basic microbial metabolism

Assessment of microbiological environmental and food safety

General microbial ecology

Microbial metabolic diversity

Food microbiology

Biogeochemical cycles:

Carbon & nitrogen

Sulphur & iron

Biogeochemical processes in action

Microbial symbioses – Plant symbioses:

Phosphorous and mycorrhizas

Nitrogen, mycorrhizas and rhizobia

Microbial-mediated decomposition in soils

Plant pathogenesis

Microbial Symbiosis – Animal:

Gut microbiology

Human pathogens

Microbial pathogenesis, including viruses

Microbial genetics and molecular ecology:

Introduction to methods in microbial ecology

Transformation

Plasmids & Conjugation

Transposons

Genetic analysis (Random insertion mutagenesis; directed knockout mutagenesis)

Laboratories:

Check university website for times and rooms in case of changes. Students need to prepare in advance for the labs; assessments **will** begin in the first lab.

Please note that attendance of all laboratories is **compulsory**. Because of practical constraints, labs cannot be made up for when missed.

Field trip:

The final laboratory will be a field trip to a facility that uses microorganisms at an industrial scale (e.g. wastewater facility, brewery, cheesery etc.). The field trip is compulsory and is assessed.

Textbooks:

The course textbook (also for BIOL313) is *Brock - Biology of Microorganisms 16th Edition (Global edition)*. *Prescott's Microbiology 9th Ed* (Willey, Sherwood, Woolverton) is also a useful textbook for the course. The text book can be purchased from the Bookshop, online and are also available in the library.

LEARN:

This course is supported by LEARN. You will find electronic copies of lecture notes and other material distributed solely by this method. Please also note that written work will be requested in hard copy (for grading) and electronic form (for assessment of originality using *Turnitin*). Instructions will be given on how you do this via LEARN. The course is attempting to be as environmentally friendly as possible, so you will receive a minimum of 'paper' handouts.

Aromatawai | Assessment

Academic skills test	5 %
Mid-Semester test	20 %
Laboratory	35 %
Final exam	40 %

IMPORTANT: You must achieve >40 % in both your final exam, and your sum aggregate of your academic skills test, mid-semester test and laboratory component in order to pass this course.

There will be penalties for late submission of work or absence from laboratories and tests. See the 'Rules and regulations...' Document in LEARN.

What is expected in assessments? The expectations for assessment items relate to the learning outcomes above. However, a general marking rubric is as follows:

- A to A+: Evidence that the student has developed an individual conception of the subject from wide reading and reflection. This individual understanding will likely be applied to a novel situation.
- B+ to A-: Evidence of strategic reading from a few sources and the ability to present lecture content in the student's own words.
- C to B : Reproduction of lecture content following the structure used by the lecturer.
- D to C-: Reproduction of some lecture content without clear structure.
- E : Confusion of content or no meaningful content presented beyond knowledge that would be expected at the start of the course.

Academic skills test:

BIOL213 (plus third year undergraduate and postgraduate courses) requires that a core set of skills learnt in BIOL111 and BIOL113 to be known and to be able to be applied. These skills include the central dogma of molecular biology, basic chemistry, basic mathematical skills and core knowledge about microbial cell structure and function, metabolism and molecular biology. Within the first couple of weeks, you will be required to take this test to ensure you have the required background knowledge.

This test is held twice, is not compulsory and you can choose to take once or on both occasions. Only your top score will count.

Laboratory assessments:

You will be required to hand in reports on your laboratory work. This can represent work sheets to complete prior to lab or reports based on completed work.

Mid-year test and Final exam:

The mid-semester test will include content from the first eight lectures and associated self-learning. The content for the final exam will include material from the lectures and associated self-learning, and from the laboratory and fieldtrip content.

Kairuruku akoranga | Course coordinator

Prof. Matthew Stott, Room 537 Biology, 364-2500
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Lecturers:

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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.

Artificial Intelligence (AI) tools: Some UC assessments permit the use of Artificial Intelligence (AI) tools. Please read each assessment's guidelines carefully so you know what AI use is permitted or not, and ensure that you follow the guidance on both usage and how to declare any permitted AI usage in your assignment (e.g., do you explain the AI tools and procedures employed in the assessment Methodology section, in the Acknowledgements, or in another manner). If AI use is not expressly permitted in an assessment, assume it is not allowed. If at all unsure regards AI use and documentation, please ask your course teaching staff.

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