

## **BCHM305** **Protein Science**

0.125 EFTS, 15 Points  
Terms 1 and 2, Semester 1

### ***Whakamahuki / Description***

This course is designed to help you to understand how different proteins function and how biochemists seek to investigate protein structure and function. The course aims to introduce you to modern biochemical ideas and research, and will include a substantial amount of reading from the biochemical literature, as well as from your standard textbook. The course is intended to complement courses such as BCHM306, BCHM338, BCHM339, BCHM381, BIOL330, BIOL313. During the course our aim is to encourage and provide advice and feedback to enable you to develop skills in written and oral communication, and in the efficient acquisition of scientific information.

### ***Āhuatanga Taura / Graduate Profile***

This course will provide students with an opportunity to develop these UC Graduate Attributes ([www.canterbury.ac.nz/study/graduate-profile/students/what-are-the-graduate-attributes/](http://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: K3 Traditional and contemporary realities of Māori society.

### ***Hua ako / Course learning outcomes and Aromatawai / Associated assessment***

*At the end of the course, students are expected to be able to:*

- Analyse and critically interpret experimental data (assessment task: tutorial data analysis exercises, test, exam). GP1 and GP2.
- Explain, with detailed examples, how nature uses proteins and the relationship between a protein function and protein structure (assessment task: test, exam). GP1.
- Explain the function of cellular membranes and the proteins that facilitate the transport of molecules and signalling processes across these membranes. (assessment task: exam). GP1.

- Present complex scientific ideas in a written form that can be understood by a wide audience (assessment task: review topic relevant to protein chemistry and present a research proposal that involves a partnership with a local iwi, as part of in term assessment). GP1 and GP2.
- Provide examples to demonstrate an understanding of the scientific practice and principles of macromolecular science (assessment task: review, proposal and exam). GP1.
- Synthesise and critically evaluate primary scientific literature to generate a clear and concise argument in support of a perspective (assessment task: evaluation of a research paper, as part of in term assessment). GP1 and GP2.

### ***Pūkenga ngaio / Transferable skills***

***The following skills are developed in this course:***

- Experience in analysing protein science data generated using a variety of methods. *We will have tutorials looking at the analysis of protein science data, and you will be given the opportunity to analyse novel data.* GP1
- Critical synthesis of 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. *In tutorials, we solve current problems in protein science and/or discuss recent protein science research papers in a group environment. Together, these will develop your abilities to assess the quality of the information, and how methods are applied to research.* GP1 and GP2.
- Communicate science (spoken and written) to specialists and non-specialists in the general community, including iwi. *In a tutorial and via in term assessment, we will consider the importance of partnership with Māori culture in developing research in New Zealand and appreciate how to engage and communicate effectively with iwi.* GP2 and GP3 (K3).
- Appreciate how to commercialise new ideas relevant to protein science. *In lectures, we will cover issues relevant to the biotechnology industry and consider the pathways to commercialisation of your own ideas. (this skill maps to UC attribute: Employable, innovative and enterprising).* GP2

### **2021 Course Evaluation**

(Scoring used - 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree)

Question 1 - The materials provided helped me to understand what was required to succeed in this course: **4.19**

Question 2 - The organisation of this course helped me learn: **4.15**

Question 3 - I found the workload was appropriate to the level of the course: **4.31**

Question 4 - I found the assessments throughout the semester appropriate for the course: **4.35**

Question 5 - When I sought feedback on my assessments, I found it helpful: **3.96**

Selected Comments: *“I have to say that from most of the assessments that I’ve done so far the PyMOL assignment was one of the most interesting and fun to do”, “Supplementary reading material for the assignments would have been useful. For example, a detailed pdf on how to use PyMol”, “The lecture notes are easy to follow and the lectures always emphasise important thing”.*

## ***Aromatawai / Assessment***

In-term assignments:	30%
Test (2 hours):	30%
Exam: (2 hours):	40%

## **Electronic Distribution of Course Material**

All course material will be distributed on Learn. This will include

- \* course notices
- \* lecture handouts that will be available before the lectures.
- \* audio recordings of lectures (using ECHO360)

## **Textbook**

Lehninger "Biochemistry" 7th Edition. Standard resources plus course textbook(s) and handouts.

## ***Pūkenga / Teaching staff***

Ashley Garrill (Course coordinator), School of Biological Sciences Room 420

email [ashley.garrill@canterbury.ac.nz](mailto:ashley.garrill@canterbury.ac.nz)

Ren Dobson, School of Biological Sciences Room 424

email [renwick.dobson@canterbury.ac.nz](mailto:renwick.dobson@canterbury.ac.nz)

Vanessa Morris, School of Biological Sciences Room 422

email [vanessa.morris@canterbury.ac.nz](mailto:vanessa.morris@canterbury.ac.nz)

Aron Fenton (Erskine Fellow). Office location in School of Biological Sciences TBA.

Email: [afenton@kumc.edu](mailto:afenton@kumc.edu),

Website: <https://www.kumc.edu/school-of-medicine/academics/departments/biochemistry-and-molecular-biology/about/emeritus-faculty/afenton.html>

## ***Wātaka / Timetable***

### **Lectures**

There are 2 lectures per week for this course in terms 1 and 2. The times and locations of these will be notified on My Timetable so please check this regularly. Weeks when we hold tutorials will be indicated by the lecturers.

## *Schedule*

### **PROTEIN STRUCTURE AND FUNCTION (14 lectures & 6 tutorials, terms 1 and 2)**

This section will start off with a review session covering the basic biological macromolecules before moving onto protein chemistry. We will learn about how proteins fold physically and biologically, as well as the how proteins unfold and misfold and the consequences of protein misfolding and aggregation. We will also cover methods for investigating protein interactions and protein structures. Lastly, we will work through case studies on how we apply various methods to understand how proteins function.

Lecturer: Vanessa Morris, Ren Dobson, Aron Fenton

### **ENTREPRENEURIALISM AND COMMERCIALISATION (2 lectures, term 2)**

There are many ways to develop a scientific career. One exciting avenue is to commercialise your own ideas, either as your own start-up, or as part of a company (such as a CRI) that is commercialising an idea developed in house. We will consider topics relevant to the commercialisation of scientific ideas, including: how to develop/recognise a new idea for a commercial outcome; appreciating intellectual property; and, appreciate the various pathways to commercialisation. We will hear from a leader in the biotechnology industry and reflect on a case study relevant to their experiences.

Lecturers: Ren Dobson (as above) plus a possible guest lecturer from industry.

### **MEMBRANE PROTEINS (8 lectures & 3 tutorials, term 2)**

Membrane proteins. This section will build on the bioenergetic concepts that you learnt in the oxidative phosphorylation and photosynthesis sections of BCHM111 and BCHM222 and will be applied to membrane transport proteins. A number of these proteins will be covered, including the Na<sup>+</sup>/K<sup>+</sup> ATPase, the H<sup>+</sup> ATPase, the Ca<sup>2+</sup> ATPase, Na<sup>+</sup> and K<sup>+</sup> ion channels and Na<sup>+</sup>/H<sup>+</sup> antiporters. Signalling processes across membranes. In the tutorials, you will be given experimental data and that will allow you to identify specific proteins from that data and then devise a model to suggest how these may act in concert to enable an organism to survive an environmental stress.

Lecturer: Ashley Garrill

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

[updated March 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.
- the generation of text using artificial intelligence technology without disclosure and when it is not intended to be part of an assignment.

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

